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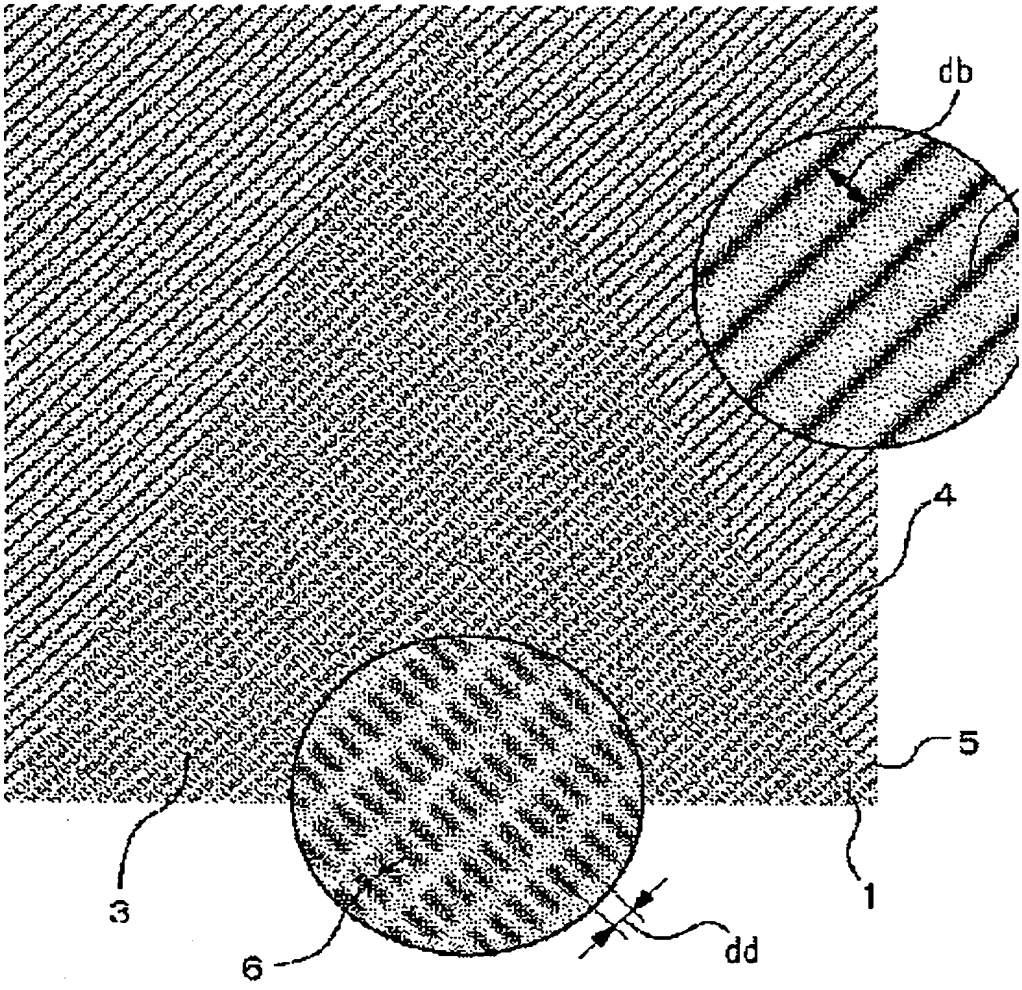
(54) AUTHENTICITY DISTINGUISHABLE PRINTED MATTER, DISTINGUISHING METHOD AND METHOD FOR FILLING INFORMATION IN PRINTED MATTER

(57) Abstract:

PROBLEM TO BE SOLVED: To provide an authenticity distinguishable printed matter due to the possibili ties of a Fourier transform, of the extraction of a specified frequency and of an inverse Fourier transform, a filled information in which is detected with digital apparatus such as a scanner or the like though not recognized with the human vision and, in addition, the Fourier transform, the extraction of the specified frequency and the inverse Fourier transform are possible.

SOLUTION: Fine printing elements 2 comprising the line drawing of a bill comprise a base printing element part and an in-pieces cutting printing element part. A plurality of the base printing element parts 5 gather to a base printing element group so as to comprise a background part 4. A plurality of the in-pieces cutting

printing element parts 1 gather to an in-pieces cutting printing element group so as to comprise an image part 3. Information is filled in the background part 4 and the image part 3. The in-pieces cutting printing element part 1 comprises a plurality of in-pieces cutting lines 6 extending normal to the longitudinal direction of the respective fine printing elements 2 arranged in parallel to one another at fixed intervals along the longitudinal direction of the fine printing elements 2.



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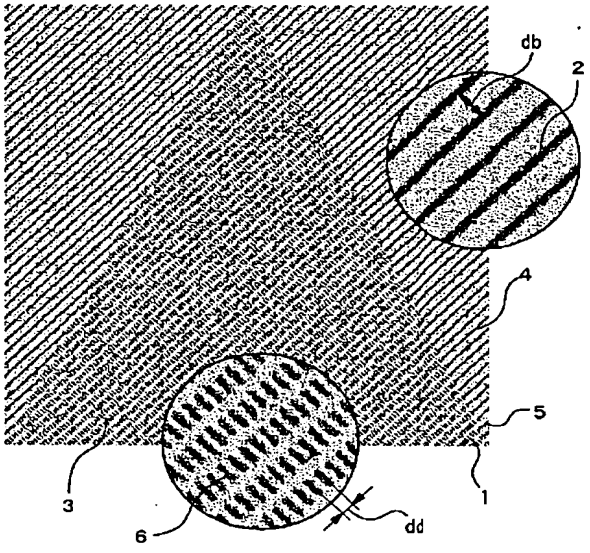
(54)【発明の名称】　真偽判別可能な印刷物及び判別方法、並びに該印刷物への情報の埋め込み方法

(57)【要約】
【課題】　人間の視覚では認識できないが、スキャナ等のデジタル機器で埋め込んだ情報を検知し、フーリエ変換、特定周波数の抽出、逆フーリエ変換が可能で、これにより真偽判別可能な印刷物を実現する。
【解決手段】　証券用線画を構成する細画線２は、基本画線部及び分断画線部から成り、基本画線部５は複数本集まって基本画線群となり背景部４を構成し、分断画線部１は複数本集まって分断画線群となり画像部３を構成して、背景部４と画像部３から情報が埋め込まれ、分断画線部１は、夫々細画線２の長手方向に直交する方向に延びる分断線６が、上記細画線２の長手方向に沿って互いに所定の間隔をもって複数本並列されて構成されている。



【特許請求の範囲】

【請求項１】　複数本の細画線から成る証券用線画を有し、該細画線は、それぞれ一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集って基本画線群を構成し、上記分断画線部は複数本集って分断画線群を構成し、上記基本画線群と分断画線群から成る情報が埋め込まれた真偽判別可能な印刷物であって、

上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて構成されており、

上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンにおいて識別可能であることを特徴とする真偽判別可能な印刷物。

【請求項２】　複数本の細画線から成る証券用線画を有し、該複数本の細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群となり背景部を構成し、上記分断画線部は複数本集まって分断画線群となり画像部を構成し、上記背景部と画像部から成る情報が埋め込まれた真偽判別可能な印刷物であって、

上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて構成されており、

上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンのうち、バンドパスフィルタで所定の周波数に相当するパターンのみを抽出し、その抽出結果を逆フーリエ変換して得られる画像において識別可能であることを特徴とする真偽判別可能な印刷物。

【請求項３】　上記分断線は、基本画線部と分断画線部が同じ濃度で視覚される程度の長さ及び線幅であることを特徴とする請求項１又は２記載の真偽判別可能な印刷物。

【請求項４】　複数本の細画線から成る線画を有し、該複数本の細画線は、二以上の種類の間隔から成る分断画線部から成り所定の情報を構成している真偽判別可能な印刷物であって、

上記二以上の種類の間隔の分断画線部は、夫々上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って上記種類毎に異なる所定の間隔をもって複数本並列されて構成されており、

上記二以上の種類の間隔の分断画線部の夫々の分断線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンにおいて識別可能であることを特徴とする真偽判別可能な印刷物。

【請求項５】　上記細画線は、直線又は曲線であることを特徴とする請求項１、２、３又は４記載の真偽判別可能な印刷物。

【請求項６】　上記細画線は、一定の規則性を有し、且つ美術的な波状の曲線であることを特徴とする請求項１、２、３又は４記載の真偽判別可能な印刷物。

【請求項７】　上記細画線は、閉じた系の線であることを特徴とする請求項１～６のいずれか１項に記載の真偽判別可能な印刷物。

【請求項８】　上記分断線は、通常照明下における所望の可視反射波長範囲となるようなインキで印刷されたものであることを特徴とする請求項１～７のいずれか１項に記載の真偽判別可能な印刷物。

【請求項９】　複数本の細画線から成る証券用線画を有する印刷物を出力可能なデジタル画像データを作成し、

該デジタル画像データにおける上記複数本の細画線の夫々について、その一部又は全部を分断画線部で置き換え、上記細画線を、分断画線部に置き換えない状態である基本画線部と上記分断画線部との両方又はいずれか一方から成る構成に変換することによって、上記基本画線部が複数本集まった基本画線群と、上記分断画線部が複数本集まった分断画線群から成る情報を埋め込む真偽判別可能な印刷物の情報埋め込み方法であって、

上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列するようにして形成し、

上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンにおいて識別可能であることを特徴とする真偽判別可能な印刷物の情報埋め込み方法。

【請求項１０】　複数本の細画線から成る証券用線画を有する印刷物を出力可能なデジタル画像データを作成し、

該デジタル画像データにおける上記複数本の細画線の夫々について、その一部又は全部を分断画線部で置き換え、上記細画線を、分断画線部に置き換えない状態である基本画線部と上記分断画線部との両方又はいずれか一方から成る構成に変換することによって、上記基本画線部が複数本集まった基本画線群から成る背景部と、上記分断画線部の複数本集まった分断画線群から成る画像部とから成る情報を埋め込む真偽判別可能な印刷物の情報埋め込み方法であって、

上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列するようにして形成

し、
上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンのうち、バンドパスフィルタで所定の周波数に相当するパターンのみを抽出し、その抽出結果を逆フーリエ変換して得られる画像において識別可能であることを特徴とする真偽判別可能な印刷物の情報埋め込み方法。
【請求項１１】　複数本の細画線から成る証券用線画を有する印刷物を出力可能なデジタル画像データを作成し、
該デジタル画像データにおける上記複数本の細画線の夫々について、二以上の種類の間隔の分断画線部から選択したいずれかの種類の分断画線部で置き換え、上記複数本の細画線が二以上の種類の間隔の分断画線部から成る情報を埋め込む真偽判別可能な印刷物の情報埋め込み方法であって、
上記二以上の種類の間隔の分断画線部は、夫々上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って上記種類毎に異なる所定の間隔をもって複数本並列するようにして形成し、
上記二以上の種類の間隔の分断画線部の夫々の分断線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンにおいて識別可能であることを特徴とする真偽判別可能な印刷物の情報埋め込み方法。
【請求項１２】　複数本の細画線から成る証券用線画を有し、該細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群を構成し、上記分断画線部は複数本集まって分断画線群を構成し、上記基本画線群と分断画線群から成る情報が埋め込まれ、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて成る真偽判別可能な印刷物の真偽判別方法であって、
上記印刷物のデジタル画像データを作成し、
該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成し、
該フーリエ変換パターンにおいて、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報を識別することを特徴とする真偽判別可能な印刷物の真偽判別方法。
【請求項１３】　複数本の細画線から成る証券用線画を有し、該細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群となり背景部を構成し、上記分断画線部は複数本集まって分断画線群となり画像部を構成し、上記背景部と画像部から成る情報が埋め込まれ、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて成る真偽判別可能な印刷物の真偽判別方法であって、
上記印刷物のデジタル画像データを作成し、
該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成し、
上記フーリエ変換パターンのうちバンドパスフィルタで所定の周波数に相当するパターンのみを抽出し、その抽出結果を逆フーリエ変換して得られる画像において、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報を識別することを特徴とする真偽判別可能な印刷物の真偽判別方法。
【請求項１４】　複数本の細画線から成る証券用線画を有し、該複数本の細画線は、二以上の種類の間隔の分断画線部から成り所定の情報を構成し、上記二以上の種類の間隔の分断画線部は、夫々上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って上記種類毎に異なる所定の間隔をもって複数本並列されて成る真偽判別可能な印刷物の真偽判別方法であって、
上記印刷物を電子的に読み取りデジタル画像データを作成し、
該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成し、
該フーリエ変換パターンにおいて、上記二以上の種類の間隔の分断画線部の夫々の分断線の間隔の相関に基づき、上記情報を識別することを特徴とする真偽判別可能な印刷物の真偽判別方法。
【請求項１５】　上記フーリエ変換パターンの異方性をなくして、上記位置の相関に基づく強度を予め設定された基準値と比較して上記情報を識別することを特徴とする請求項１２又は１４記載の真偽判別可能な印刷物の真偽判別方法。
【請求項１６】　複数本の細画線から成る証券用線画を有し、該細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群を構成し、上記分断画線部は複数本集まって分断画線群を構成し、上記基本画線群と分断画線群から成る情報を構成し、上記分断画線部は、夫々上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて構成されて成る真偽判別可能な印刷物の真偽判別装置であって、
上記印刷物のデジタル画像データを作成する手段と、
該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成する手段と、
を備えており、
上記フーリエ変換パターンにおいて、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報を識別可能とすることを特徴とする真偽判別可能な印

刷物の真偽判別装置。

【請求項１７】　複数本の細画線から成る証券用線画を有し、該細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群となり背景部を構成し、上記分断画線部は複数本集まって分断画線群となり画像部を構成し、上記背景部と画像部から成る情報を埋め込み、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて構成されて成る真偽判別可能な印刷物の真偽判別装置であって、

上記印刷物のデジタル画像データを作成する手段と、

該デジタル画像データをフーリエ変換してフーリエ変換パターンをする手段と、

上記フーリエ変換パターンのうち、バンドパスフィルタで所定の周波数に相当するパターンのみを抽出し、これを逆フーリエ変換した画像を作成する手段と、

を備えており、

上記逆フーリエ変換した画像において、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報を識別可能とすることを特徴とする真偽判別可能な印刷物の真偽判別装置。

【請求項１８】　複数本の細画線から成る証券用線画を有し、該複数本の細画線は、二以上の種類の間隔から成る分断画線部から成り所定の情報を構成し、上記二以上の種類の間隔の分断画線部は、夫々上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って上記種類毎に異なる所定の間隔をもって複数本並列されて構成されて成る真偽判別可能な印刷物の真偽判別装置であって、

上記印刷物を電子的に読み取りデジタル画像データを作成する手段と、

該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成する手段と、

を備えており、

上記フーリエ変換パターンにおいて、上記二以上の種類の間隔の分断画線部の夫々の分断線の間隔の相関に基づき、上記情報を識別可能とすることを特徴とする真偽判別可能な印刷物の真偽判別装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、真偽判別可能な銀行券、株券、債券等の有価証券、各種証明書及び重要書類等の印刷物に関する。

【０００２】

【従来の技術】銀行券、株券、債券等の有価証券、各種証明書及び重要書類等の印刷物において偽造、変造防止策は重要な要素である。これら印刷物の偽造、変造防止策は主に幾何学模様を多用化した図柄をデザインに用いる方法と、印刷物に対し何等かの手段と作用を加えると目視では認識できなかった潜像を現出するような方法が【請求項１９】ある。

【０００３】前者の代表的な例は、証券印刷物等のデザインに広く用いられている地紋、彩紋模様、レリーフ模様等の幾何学模様を用いたものであるが、前記幾何学模様を用いた偽造、変造防止策としては、基本的に一定の画線幅による曲画線の集合によって模様を構成しているものである。

【０００４】これらの模様は印刷物のデザイン等の意匠性を加味し、且つ写真製版装置による抽出または複写機では再現されにくい色彩を用いたり、複雑な曲画線にして複写機及びスキャナの走査入出力に対し、モアレを発生させたりすることで偽造防止策としての役割を高めているが、最近では高機能化した写真製版装置または複写機の出現によって充分な偽造、変造防止効果をもたらしていないという欠点がある。

【０００５】また前記の印刷物に対し何等かの手段と作用を加える後者の代表的な例のうち、最も多く用いられている偽造、変造防止策は、一般的にコピー防止画線と称する一連の技術で、印刷物中に施された潜像が目視では認識できなく、複写機によって複写することにより潜像が現出するもので、このような複写機による偽造防止に適する印刷物においては、すでに開示されている次の①～③の技術手段がある。

【０００６】①基紙表面に、例えば８５線３０%の網点である微細構成素子よりなる文字を表示した複写による偽造防止に適する潜像を付与した印刷物（特開昭５７－２０３９５号公報）がある。

【０００７】②用紙の表面に網点で潜像を印刷し、万線で潜像と同濃度の背景を同時印刷し、背景を含む潜像の上面に装飾模様をコピーで再現されない程度の薄色の透明性インキで重ね刷りすることにより、印刷物表面を体裁よく仕上げた複写防止に適する印刷物（特開昭６０－７９９１号公報）がある。

【０００８】③背景の万線と干渉した時にモアレ模様を形成する平行線よりなる波形パターンを備えたオーバープリント版を用いて、用紙表面に複写機で再生されない淡色の重ね刷りを施すことにより、印刷物の表面は肉眼を幻惑するモアレ模様が形成されるので潜像の存在は識別困難となり、複写機にかけると潜像と波形パターンは再生されずに背景のみが再生される複写防止用潜像カムフラージ法（特開昭６０－８７３８０号公報）がある。

【０００９】しかし、前述①②③の方法はいずれも網点もしくは万線等の点及び線の粗密からなるスクリーンパターンでなければならないため、地紋、彩紋模様を多用している銀行券、株券、債券などの有価証券等の既存製品に用いるには適さないという欠点があった。

【００１０】本願発明者らは前述①②③の方法が有する欠点を充分補える方法として、次の④、⑤の技術手段を

すでに紹介している。

【００１１】④曲画線の集合模様を、潜像を施さない部分を一本線、潜像を施した部分を二本線以上の画線で表現し、潜像を施した部分の二本線以上の画線は、二本線以上の画線の合計の画線幅が、潜像を施さない部分の一本線の画線の画線幅と等しく、且つ、潜像を施さない部分の一本線から分岐し、更に、潜像を施さない部分と潜像を施した部分の画線上の境界線が、曲画線の集合模様を構成する基本曲線と潜像の輪郭線の交点において基本曲線に接する直線に対し、略直角に交わる直線となることを特徴とする複写防止模様の作成方法及びその印刷物（特願平６－２０６１４０号）を出願した。

【００１２】⑤曲画線の集合模様に、潜像を施さない部分を実線、潜像を施した部分を定周期断絶線で表現し、潜像を施した部分の定周期断絶線の合計上の実印刷される画線部と、画線部が断絶して欠落する非画線部の一周期において、画線部の面積に非画線部の面積を加算し、潜像を施した部分と潜像を施さない部分の曲線状方向の同一長さで同一画線面積率とする印刷物（特願平７－１３８８７９）を発明し出願した。

【００１３】これら④⑤の模様を有する印刷物によって、複写防止を必要とする銀行券、株券、債券等の有価証券、各種証明書及び重要書類等の、地紋、彩紋模様、レリーフ模様等の曲画線の集合模様に複写機による偽造、変造防止効果を付与した複写防止模様の作成方法及び印刷物を提供することができた。

【００１４】しかし、今日ではカラー複写機の高機能化及びＤＴＰ（デスクトップパブリッシング）技術の高度化によって、前述④⑤の方法のコピー防止策は十分な偽造防止策に成り得なくなって来ているのが現状である。

【００１５】そこで、このような問題の解決法として、真偽判別において大量且つ高速処理できる機械読み取り検査方法が広く採用されている。今日の印刷物の機械読み取り検査方法は、磁性インキ、赤外線反射吸収インキ、蛍光インキ等の機能性インキや、印刷媒体を形成する繊維、材質、薬品類等による素材を検知するといったこれらの技術は、人間に感知できない特定の電磁波等に起因するものであり、印刷物を作製する上で材料適性に依存するものが多く、生産コスト面において経済性の見合う製品にしか付与することができない。

【００１６】また、印刷物の生産コストを特に考慮しない方法としては、可視できる一般印刷用のインキのような印刷材料が適用可能な印刷物上の模様に対する光学読み取り方法がある。比較的容易な光学読み取り方法としては、ＯＣＲ、ＯＭＲ、バーコード、二次元コード等が公知であるが、これらの光学読み取り方法を既存製品に用いる場合は、デザイン、仕様の変更が要求される。

【００１７】また、これらの光学読み取り方法は広く市中に出回っている方法でもあり、符号が印刷画線として可視できるため、解読、改竄の危険性も予想され、偽造、変造防止方法としては不十分である。

【００１８】更に、同じく光学読み取り方法でデザイン等の意匠性を変えずに読み取り用情報を付与する方法として、一般に電子すかしと呼ばれる一連の技術がある。電子すかしは、コンシールドイメージ、デジタルすかしとも呼ばれ、主な用途として、高機能化したコピー技術やＤＴＰ技術におけるドキュメントファイルもしくはその印刷物に著作権情報を埋め込む技術である。印刷物における公知の代表的な技術としては、周波数利用型と呼ばれる方法である。

【００１９】電子すかしは複製物においてもその周波数特性の劣化が少ないと言われ、最近では著作権保護の目的でインターネット上に配信されるデジタルイメージに施されることが多い。また、印刷物においてもその効果を奏することから、ポスターなどに利用されることも多くなって来た。

【００２０】電子すかしが最も効果を発揮できるのは連続階調（写真階調）模様である。連続階調（写真階調）模様は多値画像データであるから、十分な冗長度が存在するので周波数利用型に限らず画素置換型、画素空間利用型、量子化誤差拡散型等の多くの方法が提案され、文献、特許出願も数多く、今日注目を集めている技術の一つである。

【００２１】しかしながら、有価証券に用いられる地紋、彩紋模様、レリーフ模様等の曲画線の集合模様は基本的に２値画像であるから冗長度が少ないので、電子すかしの埋め込みは困難とされ、結果として読み取り用信号が弱いために読み取り精度が低いのが課題となっている。

【００２２】従って、印刷物の材料適性に依存しない偽造、変造防止方法で、例えば銀行券、株券、債券等の有価証券、各種証明書及び重要書類等に適する偽造防止適性を有する模様を機械読み取りによって真偽判別できる有効な技術の開発が望まれている。

【００２３】

【発明が解決しようとする課題】本発明は上述の点に鑑みなされたもので、証券用線画等から構成されている証券類等の芸術性を有する印刷物において、人間が視覚で認識できないレベルで証券用線画に変調を与えることにより、その美術的な効果を損なうことなく情報を埋め込むことを目的としている。また、従来の情報埋め込み、読み取技術において使用されている情報の信号をより強くするために、規則性を有する証券用線画に分断、分岐処理を施すことにより達成するものである。

【００２４】

【課題を解決するための手段】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有し、該細画線は、それぞれ一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群を構成し、上記分

断画線部は複数本集まって分断画線群を構成し、上記基本画線群と分断画線部から成る情報が埋め込まれた真偽判別可能な印刷物であって、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて構成されており、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンにおいて識別可能であることを特徴とする真偽判別可能な印刷物を提供する。

【００２５】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有し、該複数本の細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群となり背景部を構成し、上記分断画線部は複数本集まって分断画線群となり画像部を構成し、上記背景部と画像部から成る情報が埋め込まれた真偽判別可能な印刷物であって、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて構成されており、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンのうち、バンドパスフィルタで所定の周波数に相当する画像領域のみ抽出されて得られる画像が逆フーリエ変換して得られる画像において識別可能であることを特徴とする真偽判別可能な印刷物を提供する。

【００２６】上記分断線は、基本画線部と分断画線部が同じ濃度で視覚される程度の長さ及び線幅であることを特徴とする。

【００２７】本発明は上記課題を解決するために、複数本の細画線から成る線画を有し、該複数本の細画線は、二以上の種類の間隔から成る分断画線部から成り所定の情報を構成している真偽判別可能な印刷物であって、上記二以上の種類の間隔の分断画線部は、夫々上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って上記種類毎に異なる所定の間隔をもって複数本並列されて構成されており、上記二以上の種類の間隔の分断画線部の夫々の分断線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンにおいて識別可能であることを特徴とする真偽判別可能な印刷物を提供する。

【００２８】上記細画線は、直線又は曲線である。

【００２９】上記細画線は、一定の規則性を有し、且つ美術的な波状の曲線であることを特徴とする。

【００３０】上記細画線は、閉じた系の線であることを特徴とする。

【００３１】上記分断線は、通常照明下における可視反射波長範囲となるようなインキで印刷されたものであることを特徴とする。

【００３２】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有する印刷物を出力可能なデジタル画像データを作成し、該デジタル画像データにおける上記複数本の細画線の夫々について、その一部又は全部を分断画線部で置き換え、上記細画線を、分断画線部に置き換えない状態である基本画線部と上記分断画線部との両方又はいずれか一方から成る構成に変換することによって、上記基本画線部が複数本集まった基本画線群と、上記分断画線部の複数本集まった分断画線群とから成る情報を埋め込む真偽判別可能な印刷物の情報埋め込み方法であって、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列するようにして形成し、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンにおいて識別可能であることを特徴とする真偽判別可能な印刷物の情報埋め込み方法を提供する。

【００３３】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有する印刷物を出力可能なデジタル画像データを作成し、該デジタル画像データにおける上記複数本の細画線の夫々について、その一部又は全部を分断画線部で置き換え、上記細画線を、分断画線部に置き換えない状態である基本画線部と上記分断画線部との両方又はいずれか一方から成る構成に変換することによって、上記基本画線部が複数本集まった基本画線群から成る背景部と、上記分断画線部の複数本集まった分断画線群から成る画像部とから成る情報を埋め込む真偽判別可能な印刷物の情報埋め込み方法であって、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列するようにして形成し、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンのうち、バンドパスフィルタで所定の周波数に相当する画像領域のみ抽出して得られる画像が逆フーリエ変換して得られる画像において識別可能であることを特徴とする真偽判別可能な印刷物の情報埋め込み方法を提供する。

【００３４】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有する印刷物を出力可能なデジタル画像データを作成し、該デジタル画像データにおける上記複数本の細画線の夫々について、二以上の種類の間隔の分断画線部から選択したいずれかの種類の分断画線部で置き換え、上記複数本の細画線が二以上

の種類の間隔の分断画線部から成る情報を埋め込む真偽判別可能な印刷物の情報埋め込み方法であって、上記二以上の種類の間隔の分断画線部は、夫々上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って上記種類毎に異なる所定の間隔をもって複数本並列するようにして形成し、上記二以上の種類の間隔の分断画線部の夫々の分断線の間隔の相関に基づき、上記情報が、上記印刷物のデジタル画像データがフーリエ変換されて得られるフーリエ変換パターンにおいて識別可能であることを特徴とする真偽判別可能な印刷物の情報埋め込み方法を提供する。

【００３５】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有し、該細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群を構成し、上記分断画線部は複数本集まって分断画線群を構成し、上記基本画線群と分断画線群から成る情報が埋め込まれ、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて成る真偽判別可能な印刷物の真偽判別方法であって、上記印刷物のデジタル画像データを作成し、該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成し、該フーリエ変換パターンにおいて、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報を識別することを特徴とする真偽判別可能な印刷物の真偽判別方法を提供する。

【００３６】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有し、該細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群となり背景部を構成し、上記分断画線部は複数本集まって分断画線群となり画像部を構成し、上記背景部と画像部から成る情報が埋め込まれ、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて成る真偽判別可能な印刷物の真偽判別方法であって、上記印刷物のデジタル画像データを作成し、該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成し、上記フーリエ変換パターンのうちバンドパスフィルタで所定の周波数に相当する画像領域のみ抽出して得られる画像を逆フーリエ変換して得られる画像において、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報を識別することを特徴とする真偽判別可能な印刷物の真偽判別方法を提供する。

【００３７】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有し、該複数本の細画線は、二以上の種類の間隔の分断画線部から成り所定の情報を構成し、上記二以上の種類の間隔の分断画線部は、夫々上記細画線の長手方向に直交する方向に延び、且つ上記細画線の幅と同じ長さの分断線が、上記細画線の長手方向に沿って上記種類毎に異なる所定の間隔をもって複数本並列されて成る真偽判別可能な印刷物の真偽判別方法であって、上記印刷物を電子的に読み取りデジタル画像データを作成し、該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成し、該フーリエ変換パターンにおいて、上記二以上の種類の間隔の分断画線部の夫々の分断線の間隔の相関に基づき、上記情報を識別することを特徴とする真偽判別可能な印刷物の真偽判別方法を提供する。

【００３８】上記フーリエ変換パターンの異方性をなくして、上記位置の相関に基づく強度を予め設定された基準値と比較して上記情報を識別することを特徴とする。

【００３９】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有し、該細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群を構成し、上記分断画線部は複数本集まって分断画線群を構成し、上記基本画線群と分断画線群から成る情報を構成し、上記分断画線部は、夫々上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて構成されて成る真偽判別可能な印刷物の真偽判別装置であって、上記印刷物のデジタル画像データを作成する手段と、該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成する手段と、を備えており、上記フーリエ変換パターンにおいて、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報を識別可能とすることを特徴とする真偽判別可能な印刷物の真偽判別装置を提供する。

【００４０】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有し、該細画線は、夫々一本の線である基本画線部及び分断画線部の両方又はいずれか一方から成り、上記基本画線部は複数本集まって基本画線群となり背景部を構成し、上記分断画線部は複数本集まって分断画線群となり画像部を構成し、上記背景部と画像部から成る情報を埋め込み、上記分断画線部は、上記細画線の長手方向に直交する方向に延びる分断線が、上記細画線の長手方向に沿って互いに所定の間隔をもって複数本並列されて構成されて成る真偽判別可能な印刷物の真偽判別装置であって、上記印刷物のデジタル画像データを作成する手段と、該デジタル画像データをフーリエ変換してフーリエ変換パターンをする手段と、上記フーリエ変換パターンのうち、バンドパスフィルタで所定の周波数に相当する画像領域のみ抽出して、これを逆フーリエ変換した画像を作成する手段と、を備えており、上記逆フーリエ変換した画像において、上記基本画線群と分断画線部の夫々の画線の間隔の相関に基づき、上記情報を識別可能とすることを特徴とする真偽

判別可能な印刷物の真偽判別装置を提供する。

【００４１】本発明は上記課題を解決するために、複数本の細画線から成る証券用線画を有し、該複数本の細画線は、二以上の種類の間隔から成る分断画線部から成り所定の情報を構成し、上記二以上の種類の分断画線部は、夫々上記細画線の長手方向に直交する方向に延び、且つ上記細画線の幅と同じ長さの分断線が、上記細画線の長手方向に沿って上記種類毎に異なる所定の間隔をもって複数本並列されて構成されて成る真偽判別可能な印刷物の真偽判別装置であって、上記印刷物を電子的に読み取りデジタル画像データを作成する手段と、該デジタル画像データをフーリエ変換してフーリエ変換パターンを作成する手段と、を備えており、上記フーリエ変換パターンにおいて、上記二以上の種類の分断画線部の夫々の分断線の間隔の相関に基づき、上記情報を識別可能とすることを特徴とする真偽判別可能な印刷物の真偽判別装置をを提供する。

【００４２】

【発明の実施の形態】本発明の実施の形態を実施例に基づいて図面を参照して以下詳細に説明する。証券類、紙幣等に使用されている証券用線画は、万線状の直線（直万線）や曲線を含む画線が複数本集合して幾何学的なデザインで構成されている。このような証券用線画を構成する要素となる画線を本発明では「細画線」という。証券用線画では、複数本の細画線の間隔等において非常に高い規則性が存在する。本発明は、この規則性を評価する手段として、証券用線画の複数本の細画線の間隔の相関を評価する手段が有効である点に着目した。

【００４３】本発明は、特にこの規則性を有する証券用線画の複数本の細画線は、スキャナ、複写機等のデジタル機器では識別可能であるが、人間にとって視覚で認識困難な微細且つ規則性を有する部分を付与し、得られた印刷物に対してデジタル機器上で証券用線画の間隔の相関を分析し、印刷物に埋め込まれた情報を識別することで真偽判別が可能であり、又その情報に基づき偽造等に利用する複写機等デジタル機器の動作停止等のアクションを可能とするものである。

【００４４】人間の視覚で認識できないレベルで証券用線画に変調を与える構成として、本発明者らは、証券用線画を構成する細画線を分断させ、人間の視覚的には分断部と非分断部の濃度が同等と見えるように証券用線画の細画線の中心線と直行する方向にその長さと幅を変更した複数本の分断線を細画線方向に並列し情報を埋め込む構成を、本発明において提案するものである。また、証券用線画を並行方向に分岐させた分岐画線についても同様な手法を用いることができる。

【００４５】複数本の細画線から成る証券用線画を用いて埋め込む情報は、証券用線画の規則性、言い換えれば証券用線画の複数本の細画線の一定間隔及び埋め込む位置という２つのパラメータを有する。このようにして埋め込まれた情報を識別するには、フーリエ変換による証券用線画の複数本の細画線の間隔の相関を得た後で、特定の位置あるいは特定方向の相関のみを抽出し、或いはさらに逆フーリエ変換を行うことによりなされる。したがって、埋め込まれた情報は位置あるいは方向の相関に応じて異なる情報が得られることとなる。これを以下実施例１～７で具体的に説明する。

【００４６】（実施例１）図１～７は、実施例１を説明するための図である。図１は、単純な一定間隔d_bを有する直万線２（本発明の「細画線」に相当する）からなる印刷物であり、この印刷物に対して、１種類の情報を埋め込む方法、これによって形成された印刷物、並びにこの印刷物を認識する方法、装置について説明する。

【００４７】図１に示す印刷物をスキャナ等のデジタル機器で読み取ってビットマップデータ等のデジタル画像データとされる。或いは、コンピュータにより直接デジタル画像データを作成してもよい。いずれにしろ、このデジタル画像データは、それを印刷出力すれば複数本の直万線２を有する（万線状に細画線を複数本有する）印刷物が作成されるものである。これらの直万線は、ｘｙ座標上で次の数式１で表される。

【００４８】

【数式１】

$$y = x + 2^{1/2} n d_b$$

【００４９】ここで、ｎ＝…，－２，－１，０，１，２，…

d_bは、直万線２相互の間隔である。

【００５０】本発明では図１における数式１で表現される直万線２に、図２のような画像部３及び背景部４からなる二値画像（情報）を埋め込む。具体的には、図３において、直万線２のうち画像部３の領域にある部分は分断画線部１で構成するように置き換える。背景部４はもとの一定間隔d_bを有する直万線２のままの部分（基本画線部５）としておく。

【００５１】この分断画線部１は、人間の視覚で認識困難な、複数の分断線６が直万線３の方向に一定間隔d_dを保って直万線２の方向に並列されている。複数の分断線６は、夫々直万線２の長手方向に対して直交する方向に配列されており、分断線６の幅及び長さは人間の視覚では、基本画線部５（直万線２）の濃度と同等となるように設定しておく。図３の直万線２及び分断線６は数式２及び数式３で表される。

【００５２】

【数式２】

$$y = F_b(x, y) \quad (x + 2^{1/2} n_b d_b)$$

【００５３】

【数式３】

$$x = F_d(x, y)\, G_d(x, y)\ (-y + 2^{1/2} n_d d_d)$$

【0054】数式2及び式3の$F_b(x, y)$及び$F_d(x, y)$は、画像部3となる情報を埋め込む領域では、$F_b(x, y)=0$、$F_d(x, y)=1$となり、一方、背景部4となる領域では、$F_b(x, y)=1$、$F_d(x, y)=0$となり、画像の形状因子を意味する。また、n_b及びn_dは夫々独立とした整数である。また、$G_d(x, y)$は分断線を表す関数であり、分断線部で1、破断部で0を示す関数である。

【0055】以上のように複数本の直万線2の画像部3の領域に相当する部分を、分断画線部1で置き換えることにより、直万線2（細画線）は、基本画線部5及び分断画線部1の両方又はいずれか一方から成り、上記基本画線部5は複数本集まって基本画線群となり背景部4を構成し、上記分断画線部1は複数本集まって分断画線群となり画像部3（図形）を構成する。

【0056】そして、基本画線群と分断画線群は、夫々の画線間隔に基づく異なる周波数を有し、しかも背景部4と画像部3とから成る情報が埋め込まれた証券用線画を有する構成となり、これを印刷出力すれば、本発明に係る真偽判別可能な印刷物が構成される。

【0057】このようにして情報を埋め込んだ印刷物の情報を識別する手段、方法について説明する。上記印刷物をスキャナ等の読み取装置で読み込み、読み取結果をビットマップデータ（本発明の「デジタル画像データ」の一例である。）として保有する。そして、このビットマップデータをフーリエ変換する。これを数式4で表すと次の通りとなる。

【0058】

【数式4】

$$I(\underline{q}) = \int \rho(\underline{r})\, \rho(\underline{q}-\underline{r})\, \exp(-i\underline{q}\cdot\underline{r})\, dS$$

【0059】ここで、$\underline{r}$は基準点からの動径ベクトルを、$\rho(\underline{r})$は画線の密度関数を、$\underline{q}$は逆空間ベクトルを、$I(\underline{q})$は得られるフーリエ変換の$\underline{q}$における相関強度を夫々意味する。

【0060】図4は、図3の印刷物がフーリエ変換されて得られるフーリエ変換パターンである。図4には2種類の強い相関が観測される。これらの周波数q_b及び周波数q_dは、夫々直万線2の間隔d_b及び分断線6の間隔d_d及び位置の相関に対応している。要するに、基本画線群の間隔d_bと分断画線群の間隔d_dに基づく夫々の間隔の相関が、フーリエ変換パターンにおいて周波数q_b及び周波数q_dとして観測され、この強い相関として示される画像によって埋め込まれた情報が識別できる。

【0061】そして、埋め込んだ情報は分断線6の間隔d_dの間隔の相関に対応することから、図4のフーリエ変換パターンから次の数式5を用いて、図5のような周波数q_dのみを抽出するバンドパスフィルタを用いて情報の抽出を行う。

【数式5】

$$I_f(\underline{q}) = f(q)\, I(\underline{q})$$

【0062】ここで、$f(q)$は$q=q_d$の場合、$f(q)=1$となり、$q\neq q_d$の場合$f(q)=0$となる。また、$I_f(\underline{q})$はバンドパスフィルタによる画線抽出後のフーリエパターンの$\underline{q}$における相関強度を意味する。その抽出結果の逆フーリエ変換は次の式6で表現さる。

【数式6】

$$\rho_d(\underline{r}) = \int I_f(\underline{q})\, I_f(\underline{r}-\underline{q})\, \exp(-i\underline{r}\cdot\underline{q})\, d\underline{q}$$

【0063】このように逆フーリエ変換すると、その結果は図6に示すように、一定間隔を有する複数の分断線6が現出し、当初の図2における画像部3と類似したものが得られる。この逆フーリエ変換した画像によって、埋め込んだ情報を識別することができることとなる。

【0064】図7は、上記真偽判別可能な印刷物をスキャナ等で読み取って得られたビットマップデータのフーリエ変換パターンから異方性をなくして得られる、背景部と画像部の基本画線部及び分断線の間隔及び位置の相違に基づく位置相関強度を示す図である。この図7（2）により、位置相関強度Iによって一定以上の大きな強度を一次元で評価し識別することで印刷物の真偽判別が可能となる。これによると、上記のようなバンドパスフィルタによる特定周波数の抽出及び逆フーリエ変換を行わなくても埋め込まれた情報の識別が可能となる。

【0065】（実施例2）図8～12は、実施例2を説明する図である。図8は、一定の周期で波状に振動する複数の万線11（本発明の「細画線」に相当する。）からなる印刷物に、実施例1と同様の手段で、情報を埋め込んで構成される真偽判別可能な印刷物を示す。

【0066】実施例2の印刷物では、背景部12が間隔d_bの波状に振動する複数の万線14（基本画線部14）から成る基本画線群から構成されており、又画像部15が万線11の長手方向に間隔d_dの複数の分断線17から成る分断画線部10が複数集まった分断画線群で構成されている。図8に示す波状に振動する万線14及び分断線17は、次の数式7及び数式8で表現される。

【0067】

【数式7】

$$y = F_b(x, y)\ \{A\sin(\omega x) + 2^{1/2} n d_b\}$$

【0068】

【数式8】

$$x = F_d(x, y)\, G_d(x, y)\ (-y + 2^{1/2} n_d d_d)$$

【００６９】ここで、Ａ及びωは実施例１の印刷物の基本単位である直万線に振動変調を与えるために付与する振幅及びその周波数を意味する。図８に示す印刷物をスキャナ等で読み取り、読み取結果をビットマップデータとし、これをフーリエ変換して得られる画像を図９に示す。

【００７０】図９を実施例１の図４と比較すると、振動する万線１４の間隔d_bの位置相関に対応する周波数q_b及び分断線１７の間隔d_dの位置相関に対応する周波数q_dから夫々$q_b \sim q_b + \Delta b$及び$q_d - \Delta d_- \sim q_d + \Delta d_+$相関のピークが幅広く拡大している。これは、万線１４が波状の曲線であり、そして分断線１７が、この波状の曲線である万線１４上に配列することに起因する。

【００７１】これを図８の要部拡大図１０において説明すると、例えば、分断線２４と分断線２５の凹曲側の間隔２６が基本となる間隔２７（間隔d_d）と比べて短くなっている。図示はしないが、逆側、即ち凸曲側では分断線と分断線の間隔が基本となる間隔（間隔d_d）と比べて長くなっている。

【００７２】実施例２において埋め込んだ情報を識別するには、図９に示すフーリエ変換パターンの特徴で観察してもよいが、フーリエ変換パターンに対して、周波数q_dから周波数q_dにΔd_-減じた周波数及びq_dにΔd_+を加えた周波数の範囲（即ち、$q_d - \Delta d_-$から$q_d + \Delta d_+$までの周波数範囲）で、数式９に示す特性のバンドパスフィルタを利用して、図１１に示すように抽出を行う。

【００７３】

【数式９】

$$I_f(\underline{q}) = f(q)\ I(\underline{q})$$

【００７４】数式９において、$f(q)$は、$q_d - \Delta d_- \leqq q \leqq q_d + \Delta d_+$の場合、$f(q) = 1$となり、$q_d + \Delta d_+ < q$あるいは$q < q_d - \Delta d_-$の場合$f(q) = 0$となる。

【００７５】上記バンドパスフィルタを通して得られた画像を逆フーリエ変換を行うことにより、図１２に示すような画像が得られる。この画像おいて、真偽判別可能な印刷物に埋め込んだ情報が画像部１５としてを読み取ることが可能となる。なお、この逆フーリエ変換読によって得られた画像は、各ピクセルの強度に対して一定強度以下の値を有するノイズを消去することにより、さらに鮮明な情報を得ることができる。

【００７６】（実施例３）図１３は、本発明の実施例３の真偽判別可能な印刷物を示す。実施例１に係る印刷物は、両端が開いた系である複数の直万線（細画線）から成る証券用線画において、直万線を複数の分断線から成る分断画線部で置き換えて情報を埋め込んで得られる証券用線画を示したが、実施例３に係る印刷物は、閉じた系である複数の同心円２８（本発明の細画線に相当する）から成る証券用線画において、同心円２８を複数本の分断線３３から成る分断画線部３４で置き換えて情報を埋め込んだ証券用線画を示す。

【００７７】即ち、図１３に示す印刷物は、埋め込む情報の背景部２８は間隔d_bの複数本の基本画線部３０から成る基本画線群から構成しており、画像部３１は間隔d_dの複数本の分断線３３から成る分断画線部３４の集合である分断画線群で構成している。

【００７８】この印刷物は、実施例１同様にスキャナ等で読み取りビットマップデータとし、これをフーリエ変換することにより図１４に示すフーリエ変換パターンが得られる。このフーリエ変換パターンの特徴によって印刷物の埋め込まれた情報を識別できる。

【００７９】さらに、図１４において、分断線３３の間隔d_d及び位置相関に対応する周波数q_dから周波数q_dに周波数Δdを加減した範囲について、実施例２と同様にバンドパスフィルタで抽出し、この抽出結果に対して逆フーリエ変換を行う。その結果、図１５に示すような、間隔d_dの複数本の分断線３３が分断画線部、さらに分断画線群を構成して成る、画像部３１に相当する図形をを有する画像を得ることができる。この画像で埋め込んだ情報の識別が可能となる。

【００８０】（実施例４）図１９～２１は、実施例４を説明する図である。この実施例４は、実施例３と同様に閉じた系であるが、複数の同心円を、波状に振動する閉じた系の万線（細画線）に変調して得られる証券用線画に、情報を埋め込んで成る真偽判別可能な印刷物である。

【００８１】即ち、図１９に示す印刷物では、背景部４３は、間隔d_bで配列された複数の基本画線部４４から成る基本画線群から構成され、画像部４５は、間隔d_dで配列された複数本の分断線４６から成る分断画線部４２が集合してなる分断画線群から構成されており、これらの背景部４３と画像部４５から成る情報が埋め込まれた構成である。

【００８２】この印刷物に係るフーリエ変換パターンは、図２０に示すとおりである。図２０において、分断線４６の間隔d_d及び位置の相関に対応する周波数q_dから周波数q_dに周波数Δd_+を加えた範囲及びΔd_-を減じた範囲で、実施例２と同様にバンドパスフィルタで抽出し、この抽出結果に対して逆フーリエ変換を行う。その結果、図２１に示すように、間隔d_dの複数本の分断線４６が分断画線部、さらに分断画線群を構成して成る画像部４５に相当する図形を有する画像を得ることができる。この画像で埋め込んだ情報の識別が可能となる。

【００８３】（実施例５）図２２～２６は、実施例５を説明する図であり、実施例５は、２種類の画像が証券用

線画に対して情報として埋め込まれる構成を特徴とする。具体的には、実施例２では、図２２に示すように、画像部ａには「Ａ」という画像、画像部ｂには「Ｂ」という画像を、埋め込み情報として埋め込む構成である。

【００８４】図２３は同心円（本発明の細画線に相当する。）から成る証券用線画において、背景部５２には間隔５３を４００μｍに設定した基本画線部５４、画像部ａには間隔４７を１６３μｍに設定した分断線４８、画像部ｂには間隔４９を１１４μｍに設定した分断線５０によって、同心円の証券用線画に交互に情報を配置し構成したものである。

【００８５】図２３に示す印刷物をスキャナで読み取りビットマップデータとして、これをフーリエ変換して得られるフーリエ変換パターンは、図２４に示すとおりである。このフーリエ変換パターンでは、基本画線部５４の間隔５３の４００μｍに間隔の相関に対応する周波数q_bと分断線４８の間隔４７の１６３μｍの間隔の相関に対応する周波数q_{d1}と分断線５０の間隔４９の１１４μｍに対応する周波数q_{d2}が観測される。

【００８６】さらに図２５に示すように、周波数q_{d1}から周波数q_{d1}に周波数Δd_+を加えた範囲及びΔd_-を減じた範囲で、実施例４で説明したと同様に、バンドパスフィルタａ'を用いた抽出結果に対して逆フーリエ変換を行うと、画像ａ"のように「Ａ」という画像を認識することができる。同様に、図２６に示すように、周波数q_{d2}から周波数q_{d2}に周波数Δd_+を加えた範囲及びΔd_-を減じた範囲で、バンドパスフィルタｂ'を用いた抽出結果に対して逆フーリエ変換を行うと、画像ｂ"のように「Ｂ」という画像を認識することができる。

【００８７】（実施例６）上述の実施例では２次元の図柄としての画像情報の付与を目的としているが、印刷物特定方法を簡便にするには、読み取装置において印刷物中の２次元の図柄としての情報として認識する必要はない。即ち、印刷物に特徴的な画線の間隔の相関を有する時にその印刷物を特定し、真偽判別を可能とする構成としてもよい。

【００８８】例えば、一般的な図１６に示すような証券用線画の例である彩紋エレメント３６を用いて複数の情報を埋め込む方法及びその印刷物の構成について説明する。図１７は図１６の彩紋エレメント３６を構成する複数の細画線を、一本おきに、間隔３７を１６３μｍに設定した複数の分断線３８から成る分断画線部３５と、間隔３９を１１４μｍに設定した複数の分断線４０から成る分断画線部４１とで置き換えて構成した。

【００８９】図１６に示す画像をビットマップデータとし、これをフーリエ変換して得られたフーリエ変換パターンは図２７に示すとおりである。さらに図１７に示す画像をビットマップデータとし、これをフーリエ変換して得られたフーリエ変換パターンは図１８に示すとおりである。この図１８において図２７と比較した場合、分断線３８の間隔３７の１６３μｍの間隔の相関に対応する周波数q_{d1}と分断線の間隔３９の１１４μｍに対応する周波数q_{d2}が観測される。

【００９０】そして、印刷物読み取時のビットマップデータに対するフーリエ変換パターンの異方性をなくし一次元で評価した場合、図７に示すように、分断線３８及び分断線４０を施していないフーリエ変換パターン図２７の一次元評価の図７（１）と比較し、分断線３８及び分断線４０を施しているフーリエ変換パターン図１８の一次元評価の図７（２）では、間隔及び位置相関強度Ｉによって一定以上の大きな強度を識別することで印刷物の特定が可能となる。即ち、ビットマップデータのフーリエ変換パターンの周波数q_{d1}及び周波数q_{d2}の間隔の相関強度Ｉｑが一定以上であれば、印刷物は特定の証券類であることを認識し、偽造防止効果を発揮することができる。

【００９１】また実施例５と同様に、フーリエ変換結果の周波数q_{d1}と、周波数q_{d2}夫々の高次の間隔の相関による周波数の影響を受けない場所に設定すると、より認識精度を高めることができる。図７に示すような識別手段によれば、バンドパスフィルタによる特定周波数の抽出と、この抽出された画像の逆フーリエ変換というプロセスは不要となる。

【００９２】（実施例７）印刷物に情報を埋め込むエレメントを通常照明下における反射波長範囲が６００ｎｍから７００ｎｍとなるようなインキで印刷を行う。この場合、読み取装置には６００ｎｍから７００ｎｍの光のみを透過するフィルタを装着すれば、その他の印刷物上の多くのエレメントはフィルタにより除去され、不必要なノイズを除去することが可能となる。この結果、フーリエ変換、バンドパスフィルタによる抽出、逆フーリエ変換を経て得られる情報の強度とノイズの比を大きくすることが可能となる。

【００９３】以上、本発明の実施の形態を実施例に基づいて説明したが、本発明はこのような実施例に限定されるものではなく、特許請求の範囲に記載された技術的事項の範囲内でいろいろな実施例があることは言うまでもない。

【００９４】

【発明の効果】以上の構成から成る本発明によれば、人間の視覚では認識できないが、スキャナ、複写機等のデジタル機器では埋め込んだ情報を検知することが可能であり、デジタル機器上でフーリエ変換、特定周波数の抽出、逆フーリエ変換という演算を行うことにより、埋め込んだ情報を解析することが可能となる。

【００９５】また、本発明に用いられる画線では、単色印刷においてもその情報を人間の視覚で認識することは不可能であることから、印刷画線の持つ美術的な効果減じることもない。

【００９６】また、従来の技術で述べた不可視な情報を

埋め込み、読み取る技術と比べ、規則性の高い画線から構成されているため、その情報の信号強度は非常に大きなものとなり、読み取が容易となる。

【0097】これらの効果を有するので、本発明は、銀行券、証券類、各種証明書及び重要書類等に与えた不可視な情報をデジタル機器による読み取とその情報に基づくデジタル機器の作動停止等のアクションを起動させるのに有効となる。

【図面の簡単な説明】

【図1】実施例1を説明するための図であり、一定間隔を有する直万線からなる印刷物を示す。

【図2】実施例1の印刷物の画像部の図形を説明する図である。

【図3】実施例1の印刷物を説明する図である。

【図4】実施例1の印刷物のフーリエ変換パターンを示す図である。

【図5】実施例1に係るバンドパスフィルタによる抽出を説明する図である。

【図6】実施例1のフーリエ変換パターンをバンドパスフィルタを通してから逆フーリエ変換によって得られた画像を示す図である。

【図7】印刷物のフーリエ変換パターンから異方性をなくして得られる間隔の相関強度を示す図である。

【図8】実施例2の印刷物を説明する図である。

【図9】実施例2の印刷物のフーリエ変換パターンを示す図である。

【図10】図8の要部拡大図を示す。

【図11】実施例2に係るバンドパスフィルタによる抽出を説明する図である。

【図12】実施例2のフーリエ変換パターンをバンドパスフィルタを通してから逆フーリエ変換読によって得られた画像を示す図である。

【図13】実施例3の印刷物を説明する図である。

【図14】実施例3の印刷物のフーリエ変換パターンを示す図である。

【図15】実施例3のフーリエ変換パターンをバンドパスフィルタを通してから逆フーリエ変換読によって得られた画像を示す図である。

【図16】証券用線画として利用される一般的な彩紋エレメントを示す図である。

【図17】実施例6の印刷物を説明する図である。

【図18】実施例6の印刷物のフーリエ変換パターンを示す図である。

【図19】実施例4の印刷物を説明する図である。

【図20】実施例4の印刷物のフーリエ変換パターンを示す図である。

【図21】実施例4のフーリエ変換パターンをバンドパスフィルタを通してから逆フーリエ変換読によって得られた画像を示す図である。

【図22】実施例5の印刷物を説明する図であり、埋め込まれる異なる二つの図形を示す図である。

【図23】実施例5の印刷物を説明する図である。

【図24】実施例5のフーリエ変換パターンを示す図である。

【図25】実施例5のフーリエ変換パターンのバンドパスフィルタのフィルタの抽出及び逆フーリエ変換して得られた画像を示す図である。

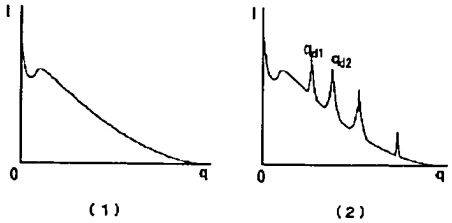
【図26】実施例5のフーリエ変換パターンのバンドパスフィルタのフィルタの抽出及び逆フーリエ変換して得られた画像を示す図である。

【図27】分断処理を施していない一般的な彩紋エレメントのフーリエ変換パターンを示す図である。

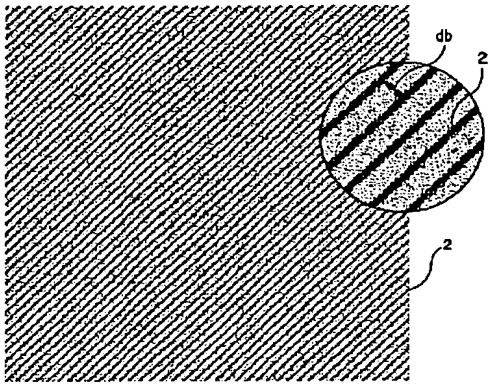
【符号の説明】

1、10、34、35、41、42　分断画線部
2　直万線
3、15、31、45　画像部
4、12、43、52　背景部
5、14、30、44、54　基本画線部
6、17、24、25、33、38、40、46、48、50　分断線
11　万線
18　振幅
19　周波数
26、37、39、47、49、53　間隔
27　分断線の基本となる間隔
28　同心円（細画線）
36　彩紋エレメント

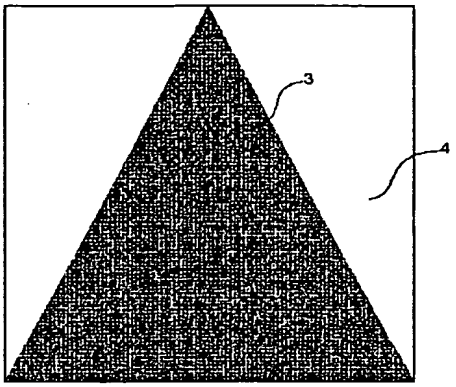
【図7】



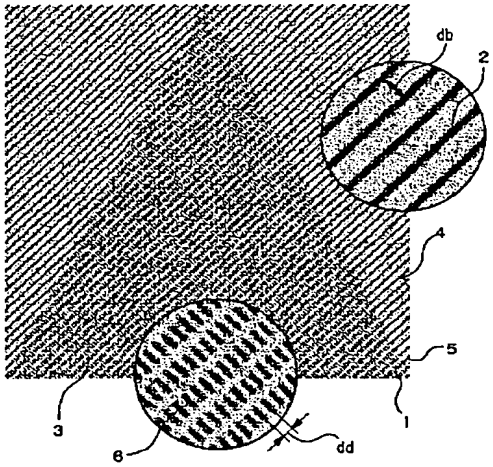
【図1】



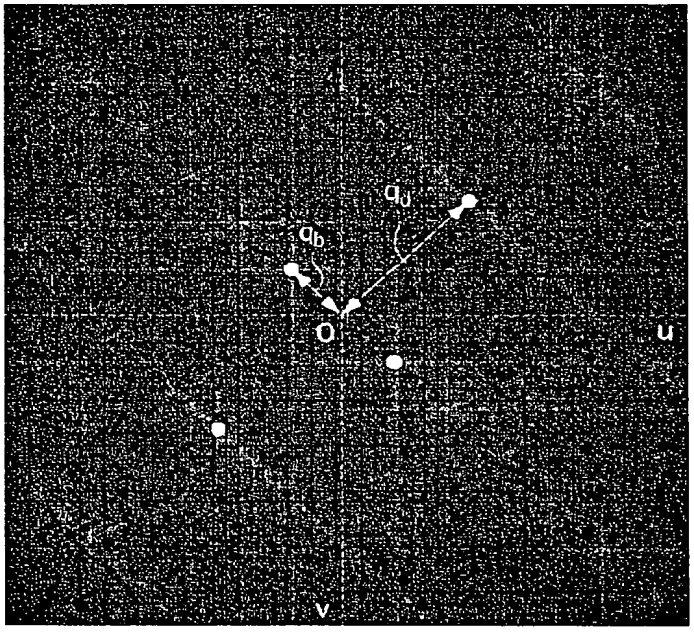
【図2】



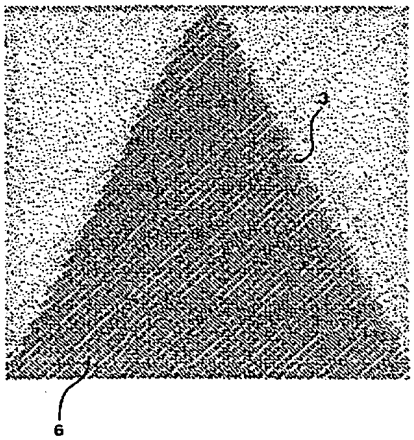
【図3】



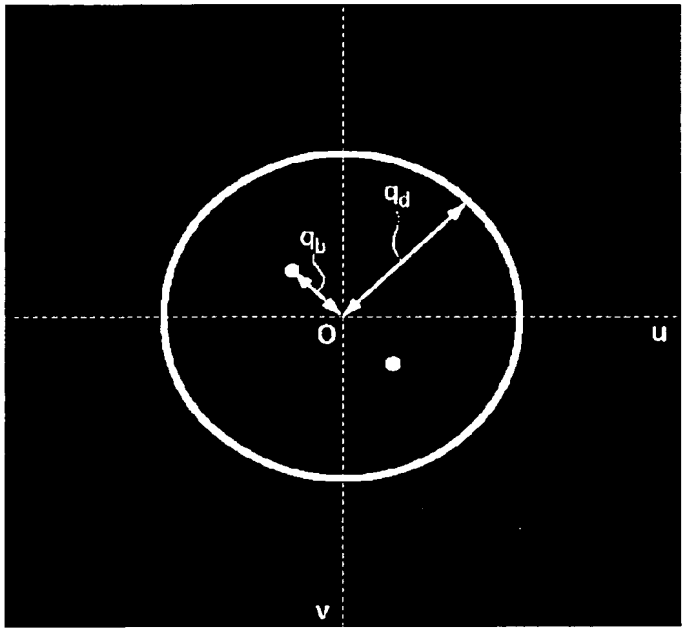
【図4】



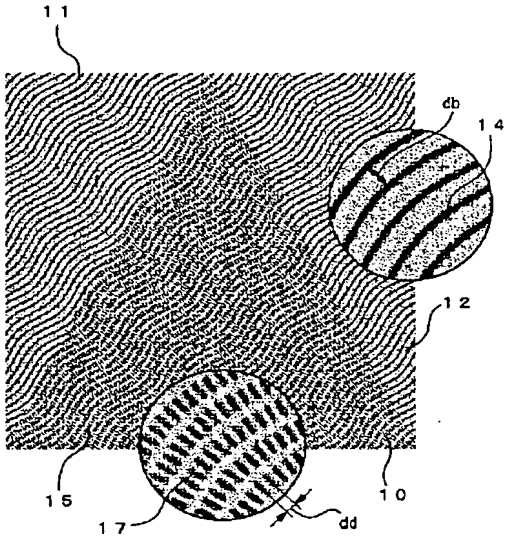
【図6】



【図5】


q_d
q_b
O
u
v

【図8】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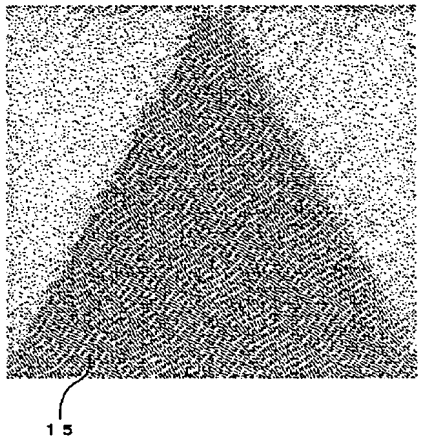
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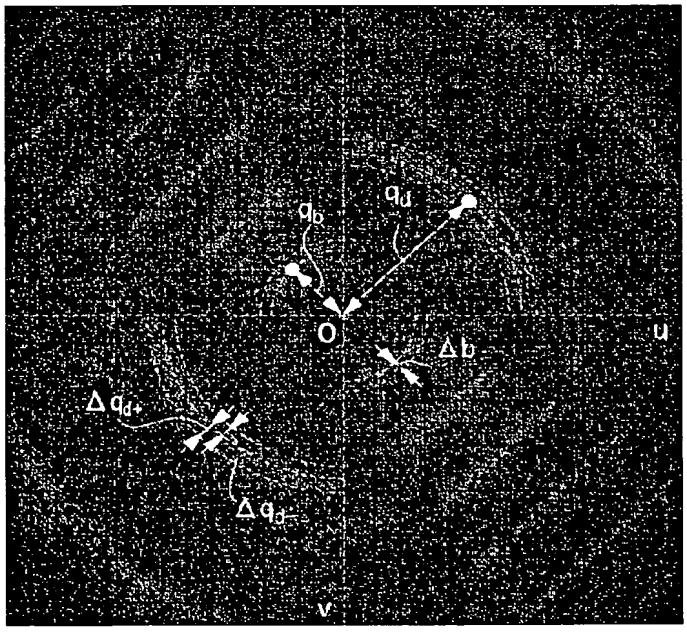
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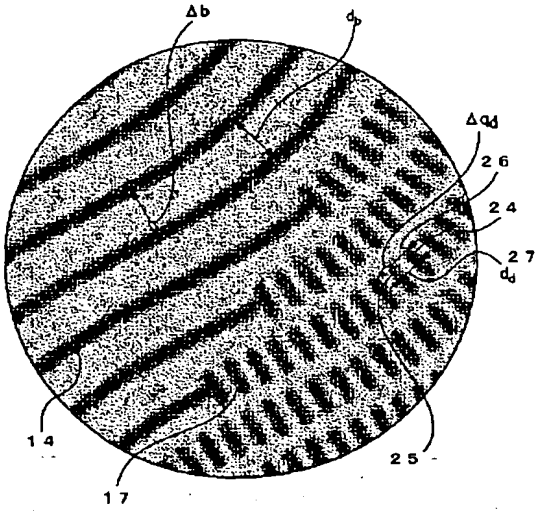
【図10】



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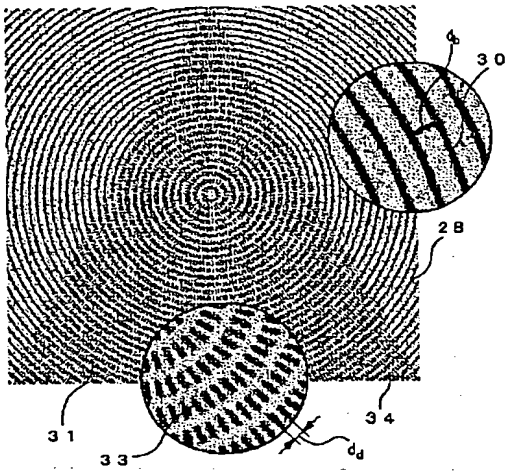

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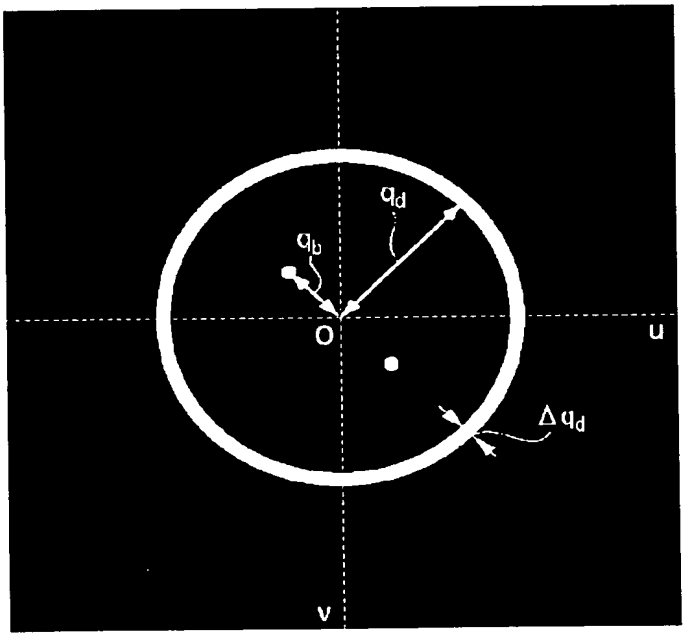

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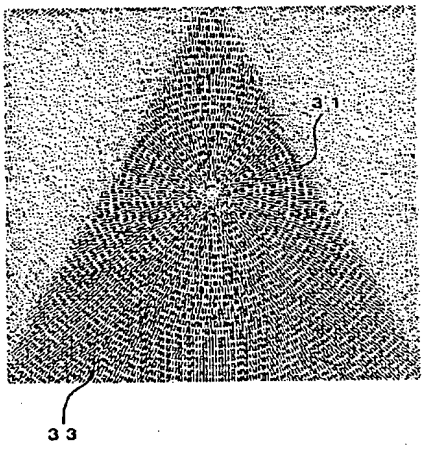

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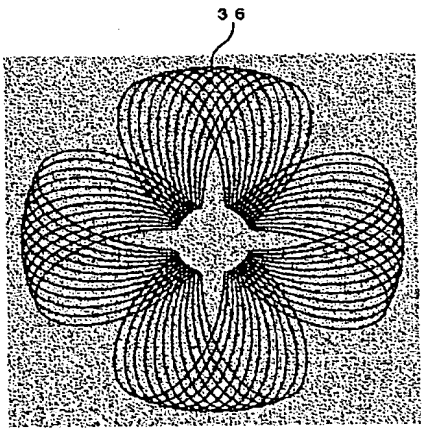

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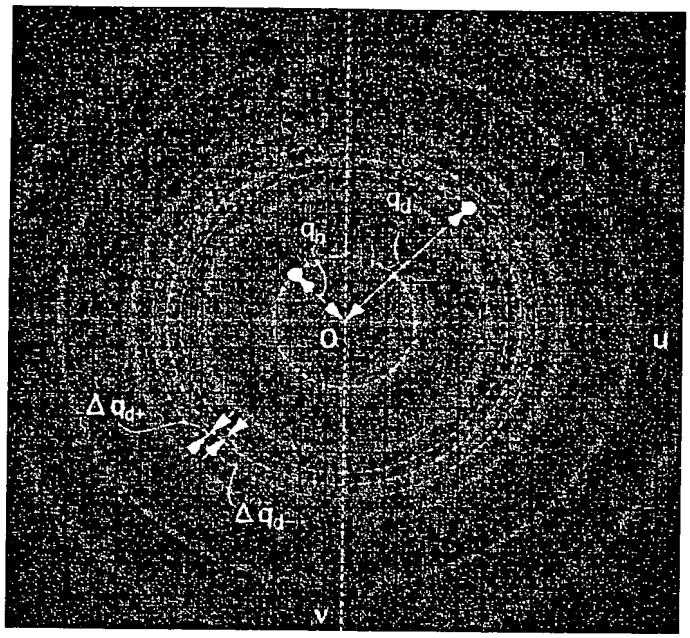

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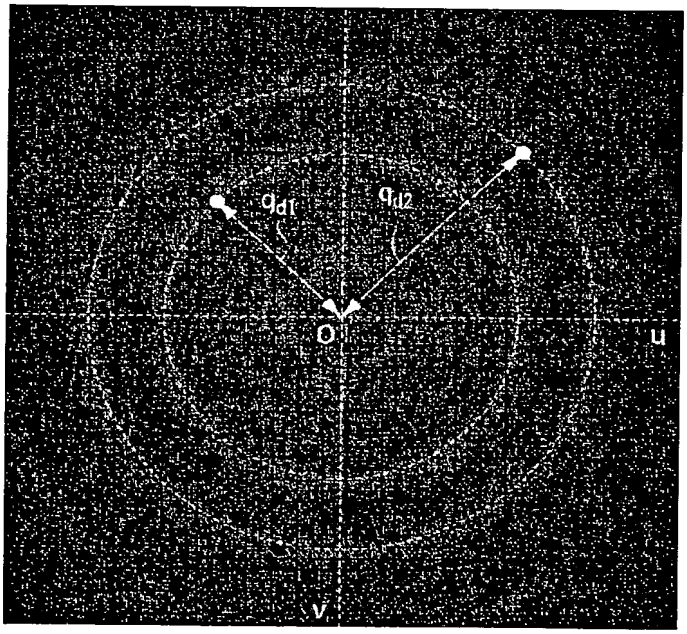

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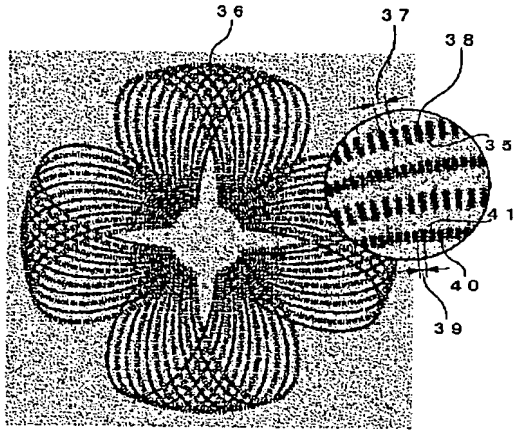

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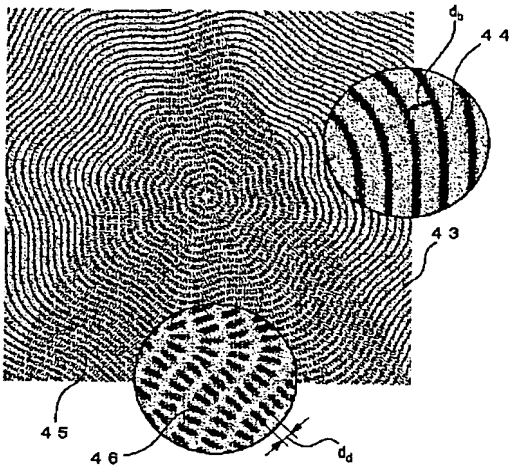

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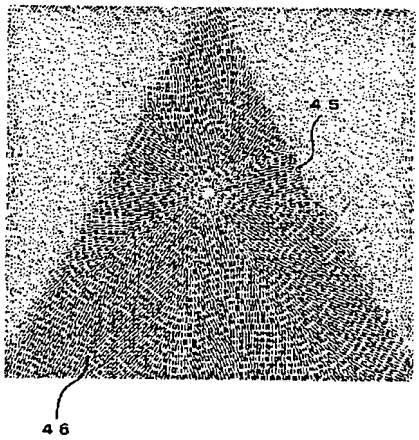

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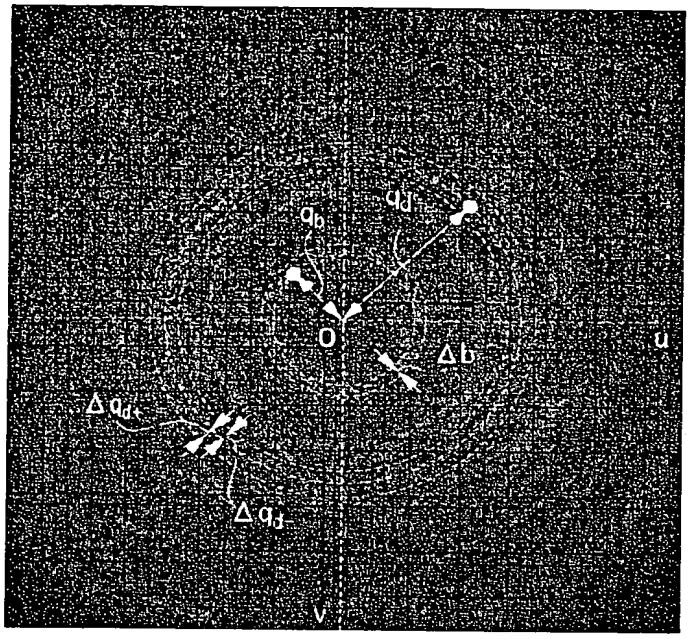

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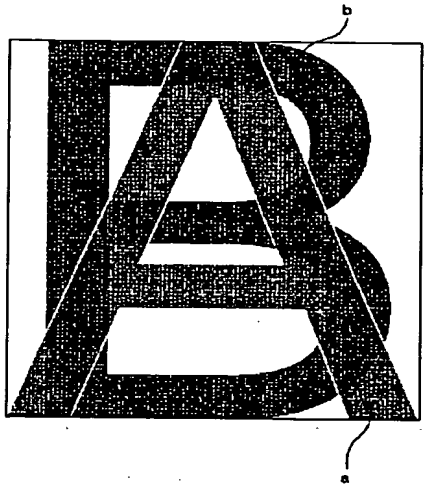

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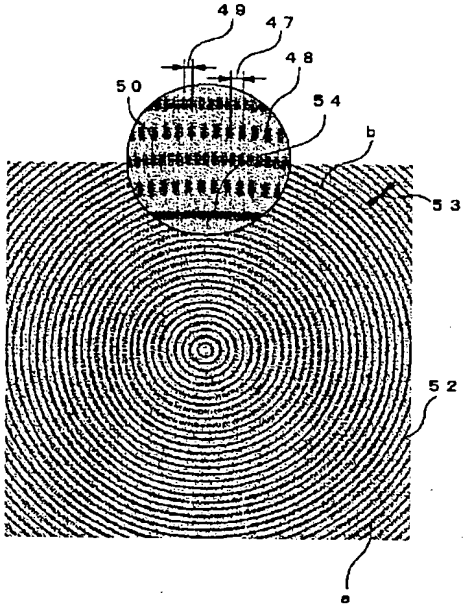

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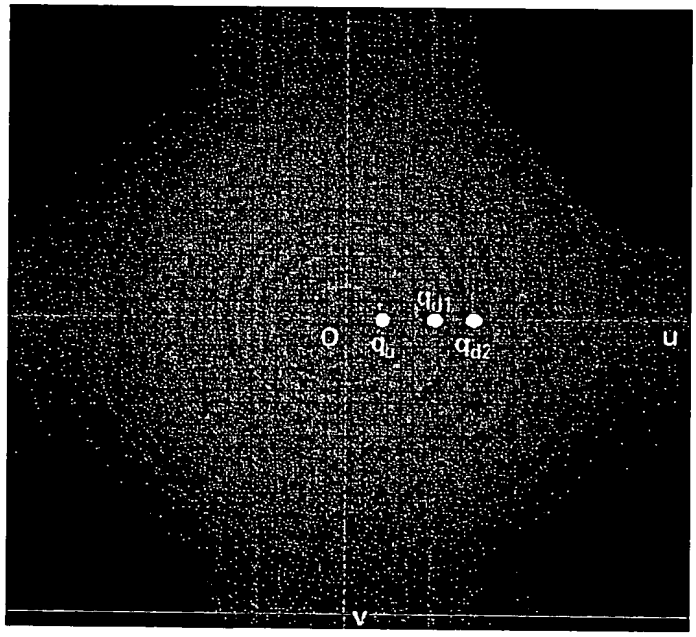

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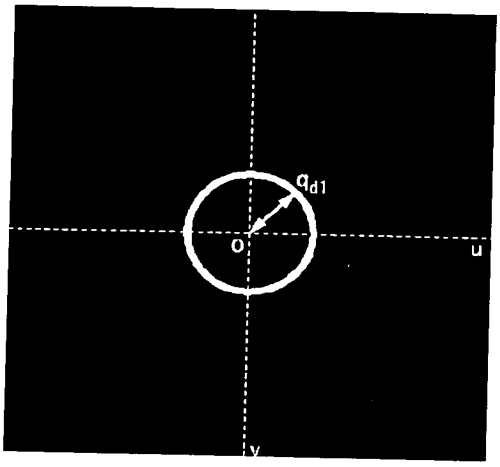

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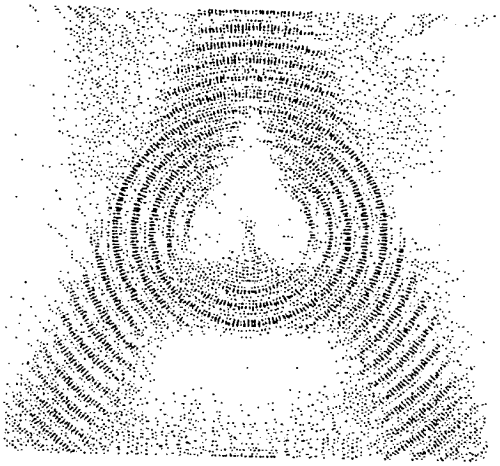

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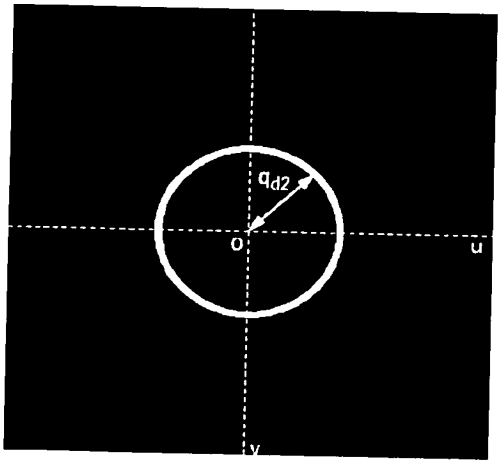

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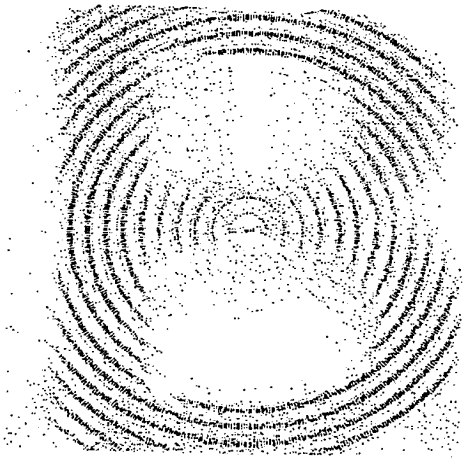

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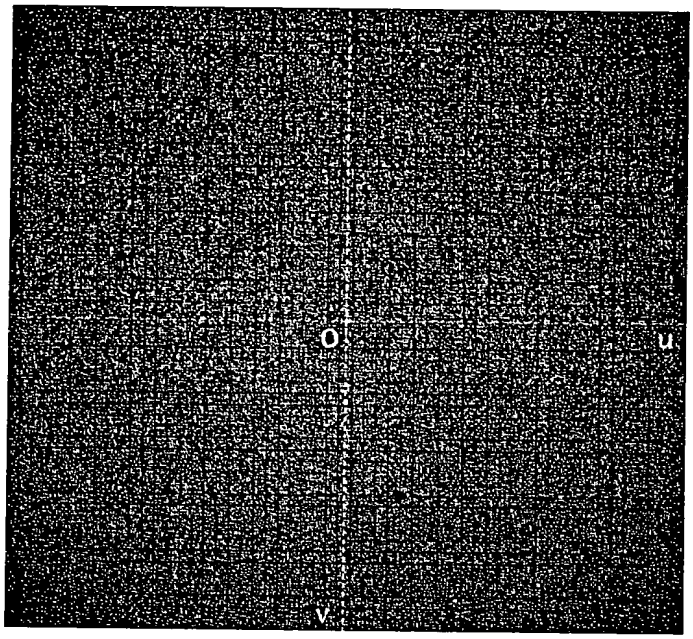

フロントページの続き

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2H113 AA06 BB02 BB22 CA39
2H134 NA01 NA15
3E041 AA01 AA02 BA11 BB03 CB03
DB01

JP 2003-2[redacted]-7

CLAIMS

[Claim(s)]
[Claim 1] It has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, and constitute a basic streak group, and two or more above-mentioned fragmentation streak sections gather, and constitute a fragmentation streak group. It is the printed matter with which the information which consists of the above-mentioned basic streak group and a fragmentation streak group was embedded and in which truth distinction is possible. the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with the predetermined interval, the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is arranged in parallel, and is constituted. Printed matter with which the above-mentioned information is characterized by the identifiable thing in the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section and in which truth distinction is possible.
[Claim 2] It has the line drawing for securities which consists of two or more thin streaks. the thin streak of these two or more books It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, serve as a basic streak group, and constitute a background. It is the printed matter with which the information which two or more above-mentioned fragmentation streak sections gather, serve as a fragmentation streak group, constitutes the picture section, and consists of the above-mentioned background and the picture section was embedded and in which truth distinction is possible. the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with the predetermined interval, the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is arranged in parallel, and is constituted. It is based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section. the above-mentioned information The inside of the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained, Printed matter which is characterized by the identifiable thing in the picture acquired by extracting only the pattern equivalent to frequency predetermined by the band pass filter, and carrying out the inverse Fourier transform of the extraction result and in which truth distinction is possible.
[Claim 3] The above-mentioned part open circuit is printed matter which is characterized by being the length and line breadth of a grade to which the visual sense of the basic streak section and the fragmentation streak section is carried out by the same concentration and in which truth distinction according to claim 1 or 2 is possible.
[Claim 4] It has the line drawing which consists of two or more thin streaks. the thin streak of these two or more books It is the printed matter which consists of the fragmentation streak section which consists of the interval of two or more kinds, and constitutes predetermined information and in which truth distinction is possible. the fragmentation streak section of the interval of two or more [above] kinds With a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-

mentioned thin streak, the-two o[redacted]e part open circuit prolonged in the di[redacted]n which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively is arranged in parallel, and is constituted. Printed matter with which the above-mentioned information is characterized by the identifiable thing in the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained based on correlation of the interval of each fragmentation line of the fragmentation streak section of the interval of two or more [above] kinds and in which truth distinction is possible.

[Claim 5] The above-mentioned thin streak is printed matter which is characterized by being a straight line or a curve and in which truth distinction according to claim 1, 2, 3, or 4 is possible.

[Claim 6] The above-mentioned thin streak is printed matter which has fixed regularity and is characterized by being an artistic wavelike curve and in which truth distinction according to claim 1, 2, 3, or 4 is possible.

[Claim 7] The above-mentioned thin streak is printed matter in which truth distinction given in any 1 term of the claims 1-6 characterized by being the line of a closed system is possible.

[Claim 8] The above-mentioned part open circuit is printed matter in which truth distinction given in any 1 term of the claims 1-7 characterized by being printed in ink which usually serves as the visible reflected wave length range of the request under lighting is possible.

[Claim 9] The digital image data in which an output of the printed matter which has the line drawing for securities which consists of two or more thin streaks is possible are created. About each of two or more above-mentioned thin streaks in these digital image data By changing into the composition which consists of both or either of the basic streak sections and the above-mentioned fragmentation streak sections which replace the part or all in the fragmentation streak section, and do not transpose the above-mentioned thin streak to the fragmentation streak section, and which are a state It is the information embedding method of the printed matter which embeds the information which consists of the basic streak group for which two or more above-mentioned basic streak sections gathered, and the fragmentation streak group for which two or more above-mentioned fragmentation streak sections gathered and in which truth distinction is possible. The part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with a predetermined interval, as two or more are arranged in parallel, it forms. The information embedding method of the printed matter in which truth distinction is possible that the above-mentioned information is characterized by the identifiable thing in the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section.

[Claim 10] It is the information embedding method of the printed matter which embeds information and in which truth distinction is possible characterized by providing the following. the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with a predetermined interval, as the part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak arranges two or more in parallel, it forms. It is based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section. the above-mentioned information The inside of the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained, The information embedding method of the printed matter which is characterized by the identifiable thing in the picture acquired by extracting only the pattern equivalent to frequency predetermined by the band pass filter, and carrying out the inverse Fourier transform of the extraction result and in which truth distinction is possible The digital image data in which an output of the printed matter which has the line drawing for securities which consists of two or more thin streaks is possible are created. About each of two or more above-mentioned thin streaks in these digital image data The background which consists of the basic streak group for which two or more above-mentioned basic streak sections gathered by changing into the composition which consists of both or either of the basic streak sections and the above-mentioned fragmentation streak sections which replace the part or all in the fragmentation streak section, and do not transpose the above-mentioned thin streak to the fragmentation streak section, and which are a state The picture section which consists of the fragmentation streak group for

which two or more above-mentioned fragmentation streak sections gather.
[Claim 11] The digital image data in which an output of the printed matter which has the line drawing for securities which consists of two or more thin streaks is possible are created. About each of two or more above-mentioned thin streaks in these digital image data It replaces in the fragmentation streak section of one which was chosen from the fragmentation streak section of the interval of two or more kinds of kinds. Two or more above-mentioned thin streaks are the information embedding methods of the printed matter which embeds the information which consists of the fragmentation streak section of the interval of two or more kinds and in which truth distinction is possible. the fragmentation streak section of the interval of two or more [above] kinds With a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, as the part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively arranges two or more in parallel, it forms. The information embedding method of the printed matter in which truth distinction is possible that the above-mentioned information is characterized by the identifiable thing in the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained based on correlation of the interval of each fragmentation line of the fragmentation streak section of the interval of two or more [above] kinds.
[Claim 12] It has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, and constitute a basic streak group, and two or more above-mentioned fragmentation streak sections gather, and constitute a fragmentation streak group. The information which consists of the above-mentioned basic streak group and a fragmentation streak group is embedded. the above-mentioned fragmentation streak section It is the truth distinction method of the printed matter in which truth distinction is possible that the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is mutually arranged in parallel with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes. Create the digital image data of the above-mentioned printed matter, carry out the Fourier transform of these digital image data, create a Fourier transform pattern, and it sets to this Fourier transform pattern. The truth distinction method of the printed matter which is characterized by discriminating the above-mentioned information from the above-mentioned basic streak group based on correlation of the interval of each streak of the fragmentation streak section and in which truth distinction is possible.
[Claim 13] It has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, serve as a basic streak group, and constitute a background. Two or more above-mentioned fragmentation streak sections gather, and serve as a fragmentation streak group, the picture section is constituted, and the information which consists of the above-mentioned background and the picture section is embedded. the above-mentioned fragmentation streak section It is the truth distinction method of the printed matter in which truth distinction is possible that the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is mutually arranged in parallel with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes. Create the digital image data of the above-mentioned printed matter, and carry out the Fourier transform of these digital image data, and a Fourier transform pattern is created. In the picture acquired by extracting only the pattern which is equivalent to frequency predetermined by the band pass filter among the above-mentioned Fourier transform patterns, and carrying out the inverse Fourier transform of the extraction result The truth distinction method of the printed matter which is characterized by discriminating the above-mentioned information from the above-mentioned basic streak group based on correlation of the interval of each streak of the fragmentation streak section and in which truth distinction is possible.
[Claim 14] It has the line drawing for securities which consists of two or more thin streaks. the thin streak of these two or more books It consists of the fragmentation streak section of the interval of two or more kinds, and predetermined information is constituted. the fragmentation streak section of the interval of two or more

[above] kinds It is the truth distinction method of the printed matter in which truth distinction is possible that the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively is arranged in parallel with a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, and changes. Read the above-mentioned printed matter electronically, create digital image data, carry out the Fourier transform of these digital image data, create a Fourier transform pattern, and it sets to this Fourier transform pattern. The truth distinction method of the printed matter which is characterized by discriminating the above-mentioned information based on correlation of the interval of each fragmentation line of the fragmentation streak section of the interval of two or more [above] kinds and in which truth distinction is possible.

[Claim 15] The truth distinction method of the printed matter which is characterized by losing the anisotropy of the above-mentioned Fourier transform pattern, and discriminating the above-mentioned information as compared with the reference value beforehand set up in the intensity based on correlation of the above-mentioned position and in which truth distinction according to claim 12 or 14 is possible.

[Claim 16] It has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, and constitute a basic streak group, and two or more above-mentioned fragmentation streak sections gather, and constitute a fragmentation streak group. The information which consists of the above-mentioned basic streak group and a fragmentation streak group is constituted. the above-mentioned fragmentation streak section It is truth distinction equipment of the printed matter with which the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively is arranged in parallel, is mutually constituted with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes and in which truth distinction is possible. Have a means to create the digital image data of the above-mentioned printed matter, and a means to carry out the Fourier transform of these digital image data, and to create a Fourier transform pattern, and it sets to the above-mentioned Fourier transform pattern. Truth distinction equipment of the printed matter which is characterized by making the above-mentioned information identifiable based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section and in which truth distinction is possible.

[Claim 17] It has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, serve as a basic streak group, and constitute a background. Two or more above-mentioned fragmentation streak sections gather, and serve as a fragmentation streak group, the picture section is constituted, and the information which consists of the above-mentioned background and the picture section is embedded. the above-mentioned fragmentation streak section It is truth distinction equipment of the printed matter with which the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is arranged in parallel, is mutually constituted with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes and in which truth distinction is possible. A means to create the digital image data of the above-mentioned printed matter, and the means which carries out the Fourier transform of these digital image data, and carries out a Fourier transform pattern, In the picture which extracted only the pattern which is equivalent to frequency predetermined by the band pass filter among the above-mentioned Fourier transform patterns, is equipped with a means to create the picture which carried out the inverse Fourier transform of this, and carried out [above-mentioned] the inverse Fourier transform Truth distinction equipment of the printed matter which is characterized by making the above-mentioned information identifiable based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section and in which truth distinction is possible.

[Claim 18] It has the line drawing for securities which consists of two or more thin streaks. the thin streak of these two or more books It consists of the fragmentation streak section which consists of the interval of two or more kinds, and predetermined information is constituted. the fragmentation streak section of the interval

of two or more [above] kinds truth distinction equipment of the printed matter with which the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively is arranged in parallel, is constituted with a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, and changes and in which truth distinction is possible. Have a means to read the above-mentioned printed matter electronically and to create digital image data, and a means to carry out the Fourier transform of these digital image data, and to create a Fourier transform pattern, and it sets to the above-mentioned Fourier transform pattern. Truth distinction equipment of the printed matter which is characterized by making the above-mentioned information identifiable based on correlation of the interval of each fragmentation line of the fragmentation streak section of the interval of two or more [above] kinds and in which truth distinction is possible.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to printed matter, such as negotiable securities, such as a bank note in which truth distinction is possible, a stock certificate, and a debenture, various certificates, and an important document.
[0002]
[Description of the Prior Art] In printed matter, such as negotiable securities, such as a bank note, a stock certificate, and a debenture, various certificates, and an important document, forgery and an alteration preventive measure are important elements. For forgery of these printed matter, and an alteration preventive measure, the method of using for a design the pattern which mainly multiple-use-ized the geometrical pattern, and a method which appears the latent image which has not been visually recognized if a certain means and operation were added to printed matter are [a claim 19]. It is.
[0003] Although geometrical patterns, such as a design widely used for designs, such as security printed matter, a **** pattern, and a relief pattern, are used for the former typical example, it constitutes the pattern by set of the music streak by fixed streak width of face fundamentally as the forgery and the alteration preventive measure using the aforementioned geometrical pattern.
[0004] Use the color which these patterns consider design nature, such as a design of printed matter, and is hard to be reproduced in the extraction or the copying machine by photoengraving-process equipment, or Although a role of a forged preventive measure is raised by making it a complicated music streak and generating moire to scanning I/O of a copying machine and a scanner There is a fault of having not brought about sufficient forgery and the alteration prevention effect with the advent of the photoengraving-process equipment which had advanced features recently, or a copying machine.
[0005] Moreover, the forgery and the alteration preventive measure which are used among the typical examples of the latter which adds a certain means and operation to the aforementioned printed matter It is that which a latent image appears when the latent image given into printed matter cannot recognize visually and copies with a copying machine with a series of technology generally called a copy prevention streak. In the printed matter suitable for the forged prevention by such copying machine, there is a technical means of ** of a degree already indicated - **.
[0006] ** There is printed matter (JP,57-20395,A) which gave the latent image suitable for the forged prevention by the copy which displayed the character which consists of a topography element which is the half tone dot of 30% of 85 lines on the base paper front face.
[0007] ** There is printed matter (JP,60-79991,A) suitable for the copy prevention which finished the printed matter front face with sufficient appearance by printing a latent image by the half tone dot on the surface of a form, carrying out simultaneous printing of the background of a latent image and this concentration by 10,000 lines, and piling up, printing and making an ornament pattern the upper surface of a latent image including a background in the transparency ink of the thin color of the grade which is not reproduced by the

copy.
[0008] ** By giving heavy printing of the light color which is not reproduced by the form front face with a copying machine using the overprint version equipped with the wave pattern which consists of parallel lines which form a moire pattern when it interferes with 10,000 lines of a background Since the moire pattern which dazzles a naked eye is formed, the front face of printed matter becomes difficult [existence of a latent image] to discriminate, and when it applies to a copying machine, a latent image and a wave pattern have the latent-image camouflaging method for copy prevention (JP,60-87380,A) only a background is reproduced without being reproduced.
[0009] However, since each method of the above-mentioned ****** had to be the screen pattern which consists of roughness and fineness of points, such as a half tone dot or 10,000 lines, and a line, it had the fault of not being suitable for using for the existing products, such as negotiable securities, such as a design, a bank note which is using the **** pattern abundantly, a stock certificate, and a debenture.
[0010] Invention-in-this-application persons consider as the method with which the fault which the method of the above-mentioned ****** has is suppliable enough, and have already introduced the technical means of ** of a degree, and **.
[0011] ** The streak more than the double lines of the portion which expressed the portion which gave single stroke lines and the latent image for the portion which does not give a latent image for the set pattern of a music streak by the streak more than double lines, and gave the latent image The streak width of face of the sum total of the streak more than double lines is equal to the streak width of face of the streak of the single stroke lines of a portion which do not give a latent image. Branch from the single stroke lines of a portion which do not give a latent image, and and the boundary line on the streak of the portion which does not give a latent image, and the portion which gave the latent image further It applied for the creation method of the copy prevention pattern characterized by the straight line which crosses an abbreviation right angle, and the bird clapper, and its printed matter (Japanese Patent Application No. No. 206140 [six to]) to the straight line which touches a basic curve in the intersection of the basic curve which constitutes the set pattern of a music streak, and the border line of a latent image.
[0012] ** In a round term of the streak section on the sum total of the fixed-cycle rupture line of the portion which expressed the portion which gave the solid line and the latent image for the portion which does not give a latent image by the fixed-cycle rupture line to the set pattern of a music streak, and gave the latent image to it real-printed, and the non-streak section which severs and lacks the streak section The area of the non-streak section was added to the area of the streak section, and by the same length of the curve-like direction of the portion which gave the latent image, and the portion which does not give a latent image, the printed matter (Japanese Patent Application No. 7-138879) made into the rate of the same streak area was invented, and it applied.
[0013] The creation method of a copy prevention pattern and printed matter which gave forgery by the copying machine and the alteration prevention effect to the set pattern of music streaks, such as designs, such as negotiable securities, such as a bank note which needs copy prevention, a stock certificate, and a debenture, various certificates, and an important document, a **** pattern, and a relief pattern, with the printed matter which has the pattern of these ****s were able to be offered.
[0014] However, it is the present condition that it is becoming impossible for the copy preventive measure of the method of the above-mentioned **** to grow into sufficient forged preventive measure by advanced features of a color copying machine and the advancement of DTP (desktop publishing) technology by the end of today.
[0015] Then, in truth distinction, extensive and the machine reading inspection method which can carry out high-speed processing are widely adopted as solution of such a problem. such technology in_which of the machine reading inspection method of today printed matter detect the material by functional ink , such as a magnetic ink , infrared reflective absorption ink , and fluorescent ink , the fiber which form a print media , the quality of the material and chemicals , etc. originate in the specific electromagnetic wave which sense to human being , and what a thing be dependent on material fitness when produce a printed matter give them only to only the product with which economical efficiency balance in many and a production cost side
[0016] Moreover, there is the optical reading method for the pattern on the printed matter which can apply printing material like the ink for general printing which can carry out visible as a method of not taking into

consideration especially the p[redacted]ction cost of printed matter. As the com[redacted]tively easy optical reading method, although OCR, OMR, a bar code, a 2-dimensional code, etc. are well-known, when using these optical reading methods for the existing product, change of a design and specification is required.
[0017] Moreover, it is also the method which has appeared on the market in the city widely, and since these optical reading methods can carry out visible [of the sign] as a printing streak, the danger of decode and an alteration is also expected and they are inadequate as forgery and the alteration prevention method.
[0018] Furthermore, there is a series of technology generally called electronic watermark as a method of giving the information for reading, without similarly changing design nature, such as a design, by the optical reading method. An electronic watermark is also called concealed DOIMEJI and digital watermark, and is technology which embeds copyright information at the document file in the high performance copy technology and high performance DTP technology, or its printed matter as main uses. As well-known typical technology in printed matter, it is the method called frequency use type.
[0019] An electronic watermark is said for there to be little degradation of the frequency characteristic also in a duplicate object, and, recently, is given to the digital image distributed on the Internet for the purpose of protection of copyrights in many cases. Moreover, since the effect is done so also in printed matter, it has also been used for the poster etc. more often.
[0020] It is a continuous tone (photograph gradation) pattern that an electronic watermark can demonstrate an effect most. A continuous tone (photograph gradation) pattern is one of the technology in which many methods, such as not only a frequency use type but a pixel substitution type, a pixel space use type, a quantization error diffusion type, etc., are proposed since it is multiple-value image data and sufficient redundancy exists, and many reference and patent application also attract attention today.
[0021] However, since the set pattern of music streaks, such as a design used for negotiable securities, a **** pattern, and a relief pattern, is a binary picture fundamentally and there is little redundancy, embedding of an electronic watermark is made difficult, since the signal for reading is weak as a result, it reads, and the low's has been [precision] a technical problem.
[0022] Therefore, development of the effective technology which can carry out truth distinction of a pattern that it has the forged prevention fitness which is the forgery and the alteration prevention method independent of the material fitness of printed matter, for example, is suitable for negotiable securities, such as a bank note, a stock certificate, and a debenture, various certificates, an important document, etc., by machine reading is desired.
[0023]
[Problem(s) to be Solved by the Invention] this invention was made in view of the above-mentioned point, and it aims at embedding information in the printed matter which has art, such as securities which consist of line drawings for securities etc., by giving a modulation to the line drawing for securities on the level which human being cannot recognize visually, without spoiling the artistic effect. Moreover, in order to strengthen more the conventional information embedding and the signal of the information currently used in reading ******, it attains by performing fragmentation and branching processing to the line drawing for securities which has regularity.
[0024]
[Means for Solving the Problem] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, and constitute a basic streak group, and two or more above-mentioned fragmentation streak sections gather, and constitute a fragmentation streak group. It is the printed matter with which the information which consists of the above-mentioned basic streak group and the fragmentation streak section was embedded and in which truth distinction is possible. the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with the predetermined interval, the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is arranged in parallel, and is constituted. Based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section, the above-mentioned information offers the printed matter which is characterized by the identifiable thing and in which

truth distinction is possible in th[redacted]urier transform pattern which the Fouri[redacted]nsform of the digital image data of the above-mentioned printed matter is carried out, and is obtained.

[0025] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. the thin streak of these two or more books It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, serve as a basic streak group, and constitute a background. It is the printed matter with which the information which two or more above-mentioned fragmentation streak sections gather, serve as a fragmentation streak group, constitutes the picture section, and consists of the above-mentioned background and the picture section was embedded and in which truth distinction is possible. the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with the predetermined interval, the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is arranged in parallel, and is constituted. It is based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section. the above-mentioned information The inside of the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained, The printed matter which is characterized by the identifiable thing in the picture from which the picture which only the picture field equivalent to frequency predetermined by the band pass filter is :xtracted, and is acquired carries out an inverse Fourier transform, and is acquired and in which truth distinction is possible is offered.

[0026] The above-mentioned part open circuit is characterized by being the length and line breadth of a grade to which the visual sense of the basic streak section and the fragmentation streak section is carried out by the same concentration.

[0027] In order that this invention may solve the above-mentioned technical problem, it has the line drawing which consists of two or more thin streaks. the thin streak of these two or more books It is the printed matter which consists of the fragmentation streak section which consists of the interval of two or more kinds, and constitutes predetermined information and in which truth distinction is possible. the fragmentation streak section of the interval of two or more [above] kinds With a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively is arranged in parallel, and is constituted. Based on correlation of the interval of each fragmentation line of the fragmentation streak section of the interval of two or more [above] kinds, the above-mentioned information offers the printed matter which is characterized by the identifiable thing and in which truth distinction is possible in the Fourier `ransform pattern which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and is obtained.

[0028] The above-mentioned thin streak is a straight line or a curve.

[0029] The above-mentioned thin streak has fixed regularity, and is characterized by being an artistic wavelike curve.

[0030] The above-mentioned thin streak is characterized by being the line of a closed system.

[0031] The above-mentioned part open circuit is characterized by being printed in ink which usually serves as a visible reflected wave length range under lighting.

[0032] The digital image data in which an output of the printed matter which has the line drawing for securities which consists of two or more thin streaks is possible in order that this invention may solve the above-mentioned technical problem are created. About each of two or more above-mentioned thin streaks in these digital image data By changing into the composition which consists of both or either of the basic streak sections and the above-mentioned fragmentation streak sections which replace the part or all in the fragmentation streak section, and do not transpose the above-mentioned thin streak to the fragmentation streak section, and which are a state It is the information embedding method of the printed matter which embeds the information which consists of the basic streak group for which two or more above-mentioned basic streak sections gathered, and the fragmentation streak group for which two or more above-mentioned fragmentation streak sections gathered and in which truth distinction is possible. The part open circuit

prolonged in the direction wh[redacted]ntersects perpendicularly with the longi[redacted]nal direction of the above-mentioned thin streak the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with a predetermined interval, as two or more are arranged in parallel, it forms. Based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section, the above-mentioned information offers the information embedding method of the printed matter which is characterized by the identifiable thing and in which truth distinction is possible in the Fourier transform pattern which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and is obtained.

[0033] The digital image data in which an output of the printed matter which has the line drawing for securities which consists of two or more thin streaks is possible in order that this invention may solve the above-mentioned technical problem are created. About each of two or more above-mentioned thin streaks in these digital image data By changing into the composition which consists of both or either of the basic streak sections and the above-mentioned fragmentation streak sections which replace the part or all in the fragmentation streak section, and do not transpose the above-mentioned thin streak to the fragmentation streak section, and which are a state It is the information embedding method of the printed matter which embeds the information which consists of the background which consists of the basic streak group for which two or more above-mentioned basic streak sections gathered, and the picture section which consists of the fragmentation streak group for which two or more above-mentioned fragmentation streak sections gathered and in which truth distinction is possible. The part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with a predetermined interval, as two or more are arranged in parallel, it forms. It is based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section. the above-mentioned information The inside of the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained, The information embedding method of the printed matter which is characterized by the identifiable thing in the picture from which the picture from which only the picture field equivalent to frequency predetermined by the band pass filter is extracted and obtained carries out an inverse Fourier transform, and is acquired and in which truth distinction is possible is offered.

[0034] The digital image data in which an output of the printed matter which has the line drawing for securities which consists of two or more thin streaks is possible in order that this invention may solve the above-mentioned technical problem are created. About each of two or more above-mentioned thin streaks in these digital image data It replaces in the division streak section of one which was chosen from the division streak section of the interval of two or more kinds of kinds. Two or more above-mentioned thin streaks are the information embedding methods of the printed matter which embeds the information which consists of the division streak section of the interval of two or more kinds and in which truth distinction is possible. the division streak section of the interval of two or more [above] kinds With a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, as the part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively arranges two or more in parallel, it forms. It is based on correlation of the interval of each division line of the division streak section of the interval of two or more [above] kinds. The above-mentioned information offers the information embedding method of the printed matter which is characterized by the identifiable thing and in which truth distinction is possible in the Fourier transform pattern which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and is obtained.

[0035] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, and constitute a basic streak group, and two or more above-mentioned fragmentation streak sections gather, and constitute a fragmentation streak group. The information which consists of the above-mentioned basic streak group and a fragmentation streak group is embedded. the above-mentioned fragmentation streak section It is the truth distinction method of the printed matter in which

truth distinction is possible that two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is mutually arranged in parallel with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes. Create the digital image data of the above-mentioned printed matter, carry out the Fourier transform of these digital image data, create a Fourier transform pattern, and it sets to this Fourier transform pattern. The truth distinction method of the printed matter which is characterized by discriminating the above-mentioned information from the above-mentioned basic streak group based on correlation of the interval of each streak of the fragmentation streak section and in which truth distinction is possible is offered.

[0036] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, serve as a basic streak group, and constitute a background. Two or more above-mentioned fragmentation streak sections gather, and serve as a fragmentation streak group, the picture section is constituted, and the information which consists of the above-mentioned background and the picture section is embedded. the above-mentioned fragmentation streak section It is the truth distinction method of the printed matter in which truth distinction is possible that the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is mutually arranged in parallel with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes. Create the digital image data of the above-mentioned printed matter, and carry out the Fourier transform of these digital image data, and a Fourier transform pattern is created. In the picture acquired by carrying out the inverse Fourier transform of the picture from which only the picture field which is equivalent to frequency predetermined by the band pass filter among the above-mentioned Fourier transform patterns is extracted and obtained The truth distinction method of the printed matter which is characterized by discriminating the above-mentioned information from the above-mentioned basic streak group based on correlation of the interval of each streak of the fragmentation streak section and in which truth distinction is possible is offered.

[0037] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. the thin streak of these two or more books It consists of the fragmentation streak section of the interval of two or more kinds, and predetermined information is constituted. the fragmentation streak section of the interval of two or more [above] kinds It is prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively, and the same fragmentation line of length as the width of face of the above-mentioned thin streak It is the truth distinction method of the printed matter which is arranged in parallel two or more with a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, and changes and in which truth distinction is possible. Read the above-mentioned printed matter electronically, create digital image data, carry out the Fourier transform of these digital image data, create a Fourier transform pattern, and it sets to this Fourier transform pattern. Based on correlation of the interval of each fragmentation line of the fragmentation streak section of the interval of two or more [above] kinds, the truth distinction method of the printed matter which is characterized by discriminating the above-mentioned information and in which truth distinction is possible is offered.

[0038] It is characterized by losing the anisotropy of the above-mentioned Fourier transform pattern, and discriminating the above-mentioned information as compared with the reference value beforehand set up in the intensity based on correlation of the above-mentioned position.

[0039] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the division streak section. Two or more above-mentioned basic streak sections gather, and constitute a basic streak group, and two or more above-mentioned division streak sections gather, and constitute a division streak group. The information which consists of the above-mentioned basic streak group and a division streak group is constituted. the above-mentioned division streak section It is truth distinction equipment of the printed matter with which the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal

direction of the above-mentio[redacted]hin streak, respectively is arranged in p[redacted]el, is mutually constituted with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes and in which truth distinction is possible. Have a means to create the digital image data of the above-mentioned printed matter, and a means to carry out the Fourier transform of these digital image data, and to create a Fourier transform pattern, and it sets to the above-mentioned Fourier transform pattern. Based on correlation of the interval of each streak of the above-mentioned basic streak group and the division streak section, the truth distinction equipment of the printed matter which is characterized by making the above-mentioned information identifiable and in which truth distinction is possible is offered.

[0040] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the division streak section. Two or more above-mentioned basic streak sections gather, serve as a basic streak group, and constitute a background. Two or more above-mentioned division streak sections gather, and serve as a division streak group, the picture section is constituted, and the information which consists of the above-mentioned background and the picture section is embedded. the above-mentioned division streak section It is truth distinction equipment of the printed matter with which the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is arranged in parallel, is mutually constituted with a predetermined interval along with the longitudinal direction of the above-nentioned thin streak, and changes and in which truth distinction is possible. A means to create the digital image data of the above-mentioned printed matter, and the means which carries out the Fourier transform of these digital image data, and carries out a Fourier transform pattern, In the picture which extracted only the picture field which is equivalent to frequency predetermined by the band pass filter among the above-mentioned Fourier transform patterns, is equipped with a means to create the picture which carried out the inverse Fourier transform of this, and carried out [above-mentioned] the inverse Fourier transform Based on correlation of the interval of each streak of the above-mentioned basic streak group and the division streak section, the truth distinction equipment of the printed matter which is characterized by making the above-mentioned information identifiable and in which truth distinction is possible is offered.

[0041] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. the thin streak of these two or more books It consists of the division streak section which consists of the interval of two or more kinds, and predetermined information is constituted. the division streak section of two or more [above] kinds It is prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively, and the same division line of length as the width of face of the above-mentioned thin streak A means to be arranged in parallel two or more with a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, and to be truth distinction equipment of the printed matter which is constituted and changes and in which truth distinction is possible, and to read the above-mentioned printed matter electronically and to create digital image data, Have a means to carry out the Fourier transform of these digital image data, and to create a Fourier transform pattern, and it sets to the above-mentioned Fourier transform pattern. Based on correlation of the interval of each division line of the division streak section of two or more [above] kinds, truth distinction ****** of the printed matter which is characterized by making the above-mentioned information identifiable and in which truth distinction is possible is offered.

[0042]

[Embodiments of the Invention] The form of operation of this invention is explained to a detail below with reference to a drawing based on an example. Two or more streaks containing the straight line (direct 10,000 lines) and curve of 10,000 lines gather, and the line drawing for securities currently used for securities, the bill, etc. consists of geometric designs. The streak used as the element which constitutes such a line drawing for securities is called "thin streak" by this invention. In the line drawing for securities, very high regularity exists in the interval of two or more thin streaks etc. this invention noted the point as a means to evaluate this regularity that a means to evaluate correlation of the interval of two or more thin streaks of the line drawing for securities was effective.

[0043] In digital instruments, such as a scanner and a copying machine, although two or more thin streaks of

the line drawing for securities in which especially this invention has this regularity are identifiable The portion with recognition difficult for human being with a visual sense which has detailed and regularity is given. Correlation of the interval of the line drawing for securities is analyzed on a digital instrument to the obtained printed matter, truth distinction is possible by discriminating the information embedded at printed matter, and actions, such as a halt of digital instruments, such as a copying machine used for forgery etc. based on the information, of operation, are made possible.

[0044] As composition which gives a modulation to the line drawing for securities on the level which cannot be recognized with human being's visual sense, this invention persons The composition which is made to divide the thin streak which constitutes the line drawing for securities, arranges in parallel two or more division lines which changed the length and width of face in the center line of the thin streak of the line drawing for securities and the direction which goes direct of human being in the direction of a thin streak so that it may look it visually that the concentration of the division section and the non-dividing section is equivalent, and embeds information It proposes in this invention. Moreover, technique with the same said of the branching streak which branched the line drawing for securities in the parallel direction can be used.

[0045] The information embedded using the line drawing for securities which consists of two or more thin streaks has the regularity of the line drawing for securities, and two parameters which in other words are called the fixed interval and the position to embed of two or more thin streaks of the line drawing for securities. Thus, in order to discriminate the embedded information, after acquiring correlation of the interval of two or more thin streaks of the line drawing for securities by the Fourier transform, it is made by extracting only correlation of a specific position or the specific direction, or performing an inverse Fourier transform further. Therefore, the information from which the embedded information differs according to correlation of a position or a direction will be acquired. Examples 1-7 explain this concretely below.

[0046] (Example 1) Drawing 1 -7 are drawing for explaining an example 1. Drawing 1 is printed matter which consists of direct 10,000 lines 2 (it is equivalent to the "thin streak" of this invention) which have the simple fixed interval db, and explains the method of embedding one kind of information, the printed matter formed of this and the method of recognizing this printed matter, and equipment to this printed matter.

[0047] The printed matter shown in drawing 1 is read with digital instruments, such as a scanner, and it considers as digital image data, such as bit map data. Or you may create direct digital image data by computer. make it any -- if this digital image data carries out the printout of it, the printed matter which has two or more direct 10,000 lines 2 (10,000 -- it has two or more thin streaks in a line) will be created These direct 10,000 lines are expressed with the following formula 1 on xy coordinate.

[0048]

[Formula 1]

$$y = x + 2^{1/2} n d_b$$

[0049] Here, -2, -1, 0, 1 and 2, --db are n=-- and an interval between direct 10,000 line 2.

[0050] In this invention, the binary picture (information) which becomes direct 10,000 lines 2 expressed with the formula 1 in drawing 1 from the picture section 3 and the background 4 like drawing 2 is embedded. Specifically, in drawing 3 , the portion which is in the field of the picture section 3 among direct 10,000 lines 2 is replaced so that it may constitute from the fragmentation streak section 1. The background 4 is taken as the portion with direct 10,000 lines 2 which have the fixed interval db of a basis (basic streak section 5).

[0051] Two or more fragmentation lines 6 with difficult recognition with human being's visual sense maintain the fixed interval dd in the direction of direct 10,000 lines 3, and this fragmentation streak section 1 is arranged in parallel in the direction of direct 10,000 lines 2. Two or more fragmentation lines 6 are arranged in the direction which intersects perpendicularly to the longitudinal direction of direct 10,000 lines 2, respectively, and with human being's visual sense, they set up the width of face and length of the fragmentation line 6 so that it may become equivalent to the concentration of the basic streak section 5 (direct 10,000 lines 2). Direct 10,000 lines 2 of drawing 3 and the part open circuit 6 are expressed with a formula 2 and a formula 3.

[0052]

[Formula 2]

$y = F_b (x, y) \quad (x + \bullet^{1/2} n_b d_b)$

[0053]
[Formula 3]
$x = F_d (x, y) G_d (x, y) \quad (-y + 2^{1/2} n_d d_d)$

[0054] In the field which embeds the information used as the picture section 3, Fb (x y) and Fd (x y) of a formula 2 and a formula 3 are set to Fb(x y) =0 and Fd(x y) =1, on the other hand, in the field used as a background 4, are set to Fb(x y) =1 and Fd(x y) =0, and mean the form factor of a picture. Moreover, nb and nd are the integers made independent, respectively. Moreover, Gd (x y) is a function showing a division line, and it is the function which shows 1 by the division line part and shows 0 in the fracture section.
[0055] The portion which is equivalent to the field of the picture section 3 of two or more direct 10,000 lines 2 as mentioned above by replacing in the division streak section 1 direct 10,000 lines 2 (thin streak) Consisting of either [either / both or] the basic streak section 5 and the division streak section 1, two or more above-mentioned basic streak sections 5 gather, serve as a basic streak group, constitute a background 4, and two or more above-mentioned division streak sections 1 gather, serve as a division streak group, and they constitute the picture section 3 (figure).
[0056] And if a basic streak group and a division streak group serve as the composition of having different frequency based on each streak interval, and having the line drawing for securities where the information which moreover consists of a background 4 and the picture section 3 was embedded and the printout of this is carried out, the printed matter concerning this invention in which truth distinction is possible is constituted.
[0057] Thus, the means and method of discriminating the information on the printed matter which embedded information are explained. The above-mentioned printed matter is read by reading ******, such as a scanner, and reading ****** is held as bit map data (it is an example of the "digital image data" of this invention.). And the Fourier transform of this bit map data is carried out. If this is expressed with a formula 4, it will become as follows.
[0058]
[Formula 4]
$I (\underline{q}) = \int \rho (\underline{r}) \rho (\underline{q} - \underline{r}) \exp (-i \underline{q} \cdot \underline{r}) dS$

[0059] Here, rho (r) means correlation intensity [in / q of the Fourier transform from which q can obtain the density function of a streak and I (q) is obtained / radius vector / from a reference point] in a reciprocal space vector / in r], respectively.
[0060] Drawing 4 is a Fourier transform pattern with which the Fourier transform of the printed matter of drawing 3 is carried out, and it is obtained. Two kinds of strong correlation is observed by drawing 4 . Such frequency qb and frequency qd correspond to the interval db of direct 10,000 lines 2, the interval dd of the part open circuit 6, and correlation of a position, respectively. In short, the correlation of each interval based on the interval db of a basic streak group and the interval dd of a division streak group is observed as frequency qb and frequency qd in a Fourier transform pattern, and the information embedded by the picture shown as this strong correlation can be discriminated.
[0061] And the embedded information extracts information from the Fourier transform pattern of drawing 4 since corresponding to correlation of the interval of the interval dd of the division line 6 using the band pass filter which extracts only frequency qd like drawing 5 using the following formula 5.
[Formula 5]
$I_f (\underline{q}) = f (q) I (\underline{q})$

[0062] Here, in q=qd, f (q) is set to f(q) =1, and, in q!=qd, is set to f(q) =0. Moreover, If (q) means the correlation intensity in q of the Fourier pattern after the streak extraction by the band pass filter. The inverse Fourier transform of the extraction result is expression **** at the following formula 6.
[Formula 6]
$\rho_d (\underline{r}) = \int I_f (\underline{q}) I_f (\underline{r} - \underline{q}) \exp (-i \underline{r} \cdot \underline{q}) d\underline{q}$

[0063] Thus, if an inverse Fouri[redacted]nsform is carried out, two or more frag[redacted]tation lines 6 which have a fixed interval as shown in drawing 6 will appear the result, and the picture section 3 in original drawing 2 and a similar thing will be obtained. The embedded information can be discriminated by this picture that carried out the inverse Fourier transform.
[0064] Drawing 7 is drawing showing the interval of the basic streak section of the background and the picture section which lose an anisotropy and are obtained from the Fourier transform pattern of the bit map data which read with the scanner etc. the printed matter in which the above-mentioned truth distinction is possible, and were obtained, and a fragmentation line, and the position correlation intensity based on a difference of a position. By this drawing 7 (2), truth distinction of printed matter is attained by a single dimension estimating the big intensity more than fixed, and discriminating it with the position correlation intensity I. According to this, it becomes discriminable [the information embedded even if it did not perform the extraction and the inverse Fourier transform of specific frequency by the above band pass filters].
[0065] (Example 2) Drawing 8 -12 are drawing explaining an example 2. Drawing 8 is the same means as an example 1, and shows the printed matter which is constituted by embedding information and in which truth distinction is possible to the printed matter which consists of two or more 10,000 lines 11 (it is equivalent to the "thin streak" of this invention.) which vibrate wavelike a fixed period.
[0066] The fragmentation streak section 10 to which it consists of basic streak groups which consist of two or more 10,000 lines 14 (basic streak section 14) by which a background 12 vibrates wavelike [an interval db], and the picture section 15 changes from two or more fragmentation lines 17 of an interval dd to the longitudinal direction of 10,000 lines 11 is constituted from the fragmentation streak group which gathered by the printed matter of an example 2. 10,000 lines 14 and the part open circuit 17 which are shown in drawing 8 and which vibrate wavelike are expressed with a following formula 7 and a following formula 8.
[0067]
[Formula 7]

$$y = F_b(x, y)\ \{A \sin(\omega x) + 2^{1/2} n d_b\}$$

[0068]
[Formula 8]

$$x = F_d(x, y)\ G_d(x, y)\ (-y + 2^{1/2} n_d d_d)$$

[0069] Here, A and omega mean the amplitude given in order to give an oscillating modulation to direct 10,000 lines which are the base units of the printed matter of an example 1, and its frequency. The picture acquired by reading with a scanner etc. the printed matter shown in drawing 8 , using reading ****** as bit map data, and carrying out the Fourier transform of this is shown in drawing 9 .
[0070] The peak of qb-qb+deltab and qd-delta d- - qd+delta d+ correlation has expanded drawing 9 broadly, respectively from the frequency qb corresponding to position correlation of the interval db of 10,000 lines 14 which vibrate as compared with drawing 4 of an example 1, and the frequency qd corresponding to position correlation of the interval dd of the part open circuit 17. 10,000 lines 14 are wavelike curves and this originates in arranging on 10,000 lines 14 whose fragmentation lines 17 are this wavelike curve.
[0071] If this is explained in the important section enlarged view 10 of drawing 8 , the interval 26 by the side of **** of the fragmentation line 24 and the fragmentation line 25 is short compared with the basic interval 27 (interval dd), for example. Although illustration is not carried out, in the reverse, i.e., ****, side, the interval of a fragmentation line and a fragmentation line is long compared with the basic interval (interval dd).
[0072] Although you may observe in the feature of the Fourier transform pattern shown in drawing 9 in order to discriminate the information embedded in the example 2, it is deltad from frequency qd to frequency qd to a Fourier transform pattern. - It is the range of the frequency which added deltad+ to the reduced frequency and qd (namely, frequency range from qd-delta d- to qd+deltad+), and using the band pass filter of the property shown in a formula 9, as shown in drawing 11 , it extracts.
[0073]
[Formula 9]

$$I_f(\underline{q}) = f(q)\ I(\underline{q})$$

[0074] In qd-delta d-<= q<=qd+delta d+, in a formula 9, f (q) is set to f(q) =1, and, in qd+deltad+<q or q<qd-delta d-, is set to f(q) =0.
[0075] A picture as shows the picture acquired through the above-mentioned band pass filter to drawing 12 by performing an inverse Fourier transform is acquired. this picture **** -- the information embedded at the printed matter in which truth distinction is possible becomes possible [reading as the picture section 15] In addition, the picture acquired by this ********** can acquire still clearer information by eliminating the noise which has a value below fixed intensity to the intensity of each pixel.
[0076] (Example 3) Drawing 13 shows the printed matter in which truth distinction of the example 3 of this invention is possible. Although the printed matter concerning an example 1 showed the line drawing for securities from which ends replace direct 10,000 lines in the line drawing for securities which consists of two or more direct 10,000 lines (thin streak) which are open systems in the fragmentation streak section which consists of two or more fragmentation lines, embed information, and are obtained The printed matter concerning an example 3 shows the line drawing for securities which replaced the concentric circle 28 in the fragmentation streak section 34 which consists of two or more fragmentation lines 33, and embedded information in the line drawing for securities which consists of two or more concentric circles 28 (it is equivalent to the thin streak of this invention) which are closed systems.
[0077] That is, the background 28 of the information embedding the printed matter shown in drawing 13 is constituted from a basic streak group which consists of two or more basic streak sections 30 of an interval db, and constitutes the picture section 31 from a fragmentation streak group which is a set of the fragmentation streak section 34 which consists of two or more fragmentation lines 33 of an interval dd.
[0078] The Fourier transform pattern shown in drawing 14 is obtained by reading this printed matter with a scanner etc. like an example 1, using it as bit map data, and carrying out the Fourier transform of this. The information where printed matter was embedded by the feature of this Fourier transform pattern is discriminable.
[0079] Furthermore, in drawing 14 , it extracts from the interval dd of the fragmentation line 33, and the frequency qd corresponding to position correlation by the band pass filter like an example 2 about the range which adjusted frequency deltad in frequency qd, and an inverse Fourier transform is performed to this extraction result. Consequently, the picture which has ****** by which two or more fragmentation lines 33 of the interval dd as shown in drawing 15 are equivalent to the fragmentation streak section and the picture section 31 which constitutes a fragmentation streak group further and changes can be acquired. It becomes discriminable [the information embedded by this picture].
[0080] (Example 4) Drawing 19 -21 are drawing explaining an example 4. Although this example 4 is a closed system like an example 3, it is printed matter which embeds information at the line drawing for securities which modulates two or more concentric circles on 10,000 lines (thin streak) of a closed system which vibrate wavelike, and is obtained, and grows into it and in which truth distinction is possible.
[0081] That is, it consists of basic streak groups which consist of two or more basic streak sections 44 by which the background 43 was arranged at intervals of db at the printed matter shown in drawing 19 , the picture section 45 consists of fragmentation streak groups in which the fragmentation streak section 42 which consists of two or more fragmentation lines 46 arranged at intervals of dd comes to gather, and it is the composition that the information which consists of these backgrounds 43 and picture sections 45 was embedded.
[0082] The Fourier transform pattern concerning this printed matter is as being shown in drawing 20 . In drawing 20 , a band pass filter extracts from the interval dd of the fragmentation line 46, and the frequency qd corresponding to correlation of a position like an example 2 in the range which reduced the range and deltad- which added frequency deltad+ to frequency qd, and an inverse Fourier transform is performed to this extraction result. Consequently, as shown in drawing 21 , the picture which has the figure in which two or more fragmentation lines 46 of an interval dd are equivalent to the fragmentation streak section and the picture section 45 which constitutes a fragmentation streak group further and changes can be acquired. It becomes discriminable [the information embedded by this picture].
[0083] (Example 5) Drawing 22 -26 are drawing explaining an example 5, and an example 5 is characterized by the composition where two kinds of pictures are embedded as information to the line drawing for

securities. Specifically, as an exa[redacted] 2 shows to drawing 22 , it is the comp[redacted]n which embeds the picture "B" as embedding information in the picture "A", and the picture section b at the picture section a.
[0084] Drawing 23 arranges and constitutes information by turns at the line drawing for securities of a concentric circle in the line drawing for securities which consists of a concentric circle (it is equivalent to the thin streak of this invention.) by the division line 48 which set the interval 47 as 163 micrometers at the basic streak section 54 which set the interval 53 as 400 micrometers at the background 52, and the picture section a, and the division line 50 which set the interval 49 as 114 micrometers at the picture section b.
[0085] The printed matter shown in drawing 23 is read with a scanner, and the Fourier transform pattern obtained by carrying out the Fourier transform of this is as being shown in drawing 24 as bit map data. By this Fourier transform pattern, the frequency qb corresponding to correlation of an interval, the frequency qd1 corresponding to correlation with an interval [of the interval 47 of the division line 48] of 163 micrometers, and the frequency qd2 corresponding to 114 micrometers of the interval 49 of the division line 50 are observed by 400 micrometers of the interval 53 of the basic streak section 54.
[0086] If an inverse Fourier transform is similarly performed to the extraction result using band pass filter a' with the example 4 having explained in the range which subtracted the range and deltad- which added frequency deltad+ to frequency qd1 from frequency qd1 as furthermore shown in drawing 25, the picture "A" can be recognized like picture a." If similarly an inverse Fourier transform is performed from frequency qd2 to the extraction result using band pass filter b' in the range which reduced the range and deltad- which added frequency deltad+ to frequency qd2 as shown in drawing 26 , the picture "B" can be recognized like picture b."
[0087] (Example 6) Although it aims at grant of the image information as a two-dimensional pattern in the above-mentioned example, in order to make the printed matter specification method simple, it is not necessary to recognize as information as a two-dimensional pattern in printed matter in reading ******. That is, it is good also as composition which specifies the printed matter when it has correlation of the interval of a streak characteristic of printed matter, and enables truth distinction.
[0088] For example, the composition of the method of embedding two or more information using the **** element 36 which is the example of the line drawing for securities as shown in general drawing 16 , and its printed matter is explained. It replaced and constituted from the fragmentation streak section 35 which consists of two or more fragmentation lines 38 which drawing 17 set two or more thin streaks which constitute the **** element 36 of drawing 16 , and set the interval 37 as 163 micrometers every other, and the fragmentation streak section 41 which consists of two or more fragmentation lines 40 which set the interval 39 as 114 micrometers.
[0089] The Fourier transform pattern obtained by using as bit map data the picture shown in drawing 16 , and carrying out the Fourier transform of this is as being shown in drawing 27 . The Fourier transform pattern obtained by using as bit map data the picture furthermore shown in drawing 17 , and carrying out the Fourier transform of this is as being shown in drawing 18 . When it compares with drawing 27 in this drawing 18 , the frequency qd1 corresponding to correlation with an interval [of the interval 37 of the division line 38] of 163 micrometers and the frequency qd2 corresponding to 114 micrometers of the interval 39 of a division line are observed.
[0090] And when the anisotropy of the Fourier transform pattern to the bit map data at the time of printed matter ****** is lost and a single dimension estimates, as shown in drawing 7 It compares with drawing 7 (1) of single dimension evaluation of Fourier transform pattern drawing 27 which has not given the division line 38 and the part open circuit 40. At drawing 7 (2) of single dimension evaluation of Fourier transform pattern drawing 18 which has given the division line 38 and the part open circuit 40, specification of printed matter is attained by discriminating the big intensity more than fixed with an interval and the position correlation intensity I. That is, if the correlation intensity Iq of the interval of the frequency qd1 of the Fourier transform pattern of bit map data and frequency qd2 is more than fixed, printed matter can recognize that they are specific securities, and can demonstrate the forged prevention effect.
[0091] Moreover, if it is set as the place which is not influenced of the frequency qd1 of a Fourier transform result, and the frequency by correlation of the high order interval of frequency qd2 each like an example 5, recognition precision can be raised more. According to the discernment means as shown in drawing 7 , the process of extraction of the specific frequency by the band pass filter and this extracted inverse Fourier

transform of a picture become necessary.
[0092] (Example 7) It prints in ink in which the reflected wave length range under lighting is usually set to 600 to 700nm in the element which embeds information at printed matter. In this case, if reading ****** is equipped with the filter which penetrates only 600 to 700nm light, it will become possible for many elements on other printed matter to be removed by the filter, and to remove an unnecessary noise. Consequently, it becomes possible to enlarge the informational intensity and the ratio of a noise pass extraction by the Fourier transform and the band pass filter, and an inverse Fourier transform.
[0093] As mentioned above, although the form of operation of this invention was explained based on the example, it cannot be overemphasized by this invention that there are various examples within the limits of the technical matter which is not limited to such an example and indicated by the claim.
[0094]
[Effect of the Invention] Although it cannot recognize with human being's visual sense according to this invention which consists of the above composition, it becomes it is possible to detect the embedded information and possible in digital instruments, such as a scanner and a copying machine, to analyze the information embedded by performing the operation of extraction of the Fourier transform and specific frequency, and an inverse Fourier transform on a digital instrument.
[0095] moreover, artistic effect ****** which a printing streak has since it is impossible to recognize the information with human being's visual sense also in monochrome printing in the streak used for this invention -- there are also nothings
[0096] moreover, since it consists of high streaks of regularity compared with embedding and the technology to read, the signal strength of the information will become very big, the invisibility information stated by the Prior art is read, and ** becomes easy
[0097] since it has the effect of these, this invention becomes effective in starting actions according the invisibility information given to a bank note, securities, various certificates, the important document, etc. to a digital instrument, such as an operation halt of a digital instrument based on [read and] ** and its information

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TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to printed matter, such as negotiable securities, such as a bank note in which truth distinction is possible, a stock certificate, and a debenture, various certificates, and an important document.

PRIOR ART

[Description of the Prior Art] In printed matter, such as negotiable securities, such as a bank note, a stock certificate, and a debenture, various certificates, and an important document, forgery and an alteration preventive measure are important elements. If a certain means and operation are added to printed matter, visually, the method of using for a design the pattern which mainly multiple-use-ized the geometrical pattern, and a method which appears the latent image which has not been recognized forgery of these printed matter, and an alteration preventive measure [Claim 19] It is.
[0003] Although geometrical patterns, such as a design widely used for designs, such as security printed matter, a **** pattern, and a relief pattern, are used for the former typical example, it constitutes the pattern by set of the music streak by fixed streak width of face fundamentally as the forgery and the alteration

preventive measure using the aforementioned geometrical pattern.
[0004] These patterns consider design nature, such as a design of printed matter, and in the extraction or the copying machine by photoengraving-process equipment, use the color which is hard to be reproduced, or make it a complicated music streak. There is a fault of having not brought about sufficient forgery and the alteration prevention effect with the advent of [although a role of a forged preventive measure is raised by generating moire to scanning I/O of a copying machine and a scanner] the photoengraving-process equipment which had advanced features recently, or a copying machine.
[0005] Moreover, the forgery and the alteration preventive measure which are used among the typical examples of the latter which adds a certain means and operation to the aforementioned printed matter, with a series of technology generally called a copy prevention streak, visually the latent image given into printed matter cannot recognize, a latent image appears by copying with a copying machine, and it is already indicated in the printed matter suitable for the forged prevention by such copying machine -- there is a technical means of ** of a degree - **
[0006] ** There is printed matter (JP,57-20395,A) which gave the latent image suitable for the forged prevention by the copy which displayed the character which consists of a topography element which is the half tone dot of 30% of 85 lines on the base paper front face.
[0007] ** There is printed matter (JP,60-79991,A) suitable for the copy prevention which finished the printed matter front face with sufficient appearance by printing a latent image by the half tone dot on the surface of a form, carrying out simultaneous printing of the background of a latent image and this concentration by 10,000 lines, and piling up, printing and making an ornament pattern the upper surface of a latent image including a background in the transparency ink of the thin color of the grade which is not reproduced by the copy.
[0008] ** When it interferes with 10,000 lines of a background, give heavy printing of the light color which is not reproduced by the form front face with a copying machine using the overprint version equipped with the wave pattern which consists of parallel lines which form a moire pattern, Since the moire pattern which dazzles a naked eye is formed, the front face of printed matter becomes difficult [existence of a latent image] to discriminate, and when it applies to a copying machine, a latent image and a wave pattern have the latent-image camouflaging method for copy prevention (JP,60-87380,A) only a background is reproduced without being reproduced.
[0009] However, since each method of the above-mentioned ****** had to be the screen pattern which consists of roughness and fineness of points, such as a half tone dot or 10,000 lines, and a line, it had the fault of not being suitable for using for the existing products, such as negotiable securities, such as a design, a bank note which is using the **** pattern abundantly, a stock certificate, and a debenture.
[0010] Invention-in-this-application persons consider as the method with which the fault which the method of the above-mentioned ****** has is suppliable enough, and have already introduced the technical means of ** of a degree, and **.
[0011] ** The streak more than the double lines of the portion which expressed the portion which gave single stroke lines and the latent image for the portion which does not give a latent image for the set pattern of a music streak by the streak more than double lines, and gave the latent image, The streak width of face of the sum total of the streak more than double lines is equal to the streak width of face of the streak of the single stroke lines of a portion which do not give a latent image. Branch from the single stroke lines of a portion which do not give a latent image, and and the boundary line on the streak of the portion which does not give a latent image, and the portion which gave the latent image further It applied for the creation method of the copy prevention pattern characterized by the straight line which crosses an abbreviation right angle, and the bird clapper, and its printed matter (Japanese Patent Application No. No. 206140 [six to]) to the straight line which touches a basic curve in the intersection of the basic curve which constitutes the set pattern of a music streak, and the border line of a latent image.
[0012] ** In a round term of the streak section on the sum total of the fixed-cycle rupture line of the portion which expressed the portion which gave the solid line and the latent image for the portion which does not give a latent image by the fixed-cycle rupture line to the set pattern of a music streak, and gave the latent image to it real-printed, and the non-streak section which severs and lacks the streak section The area of the non-streak section was added to the area of the streak section, and by the same length of the curve-like

direction of the portion which [redacted] the latent image, and the portion which [redacted] es not give a latent image, the printed matter (Japanese Patent Application No. 7-138879) made into the rate of the same streak area was invented, and it applied.

[0013] The creation method of a copy prevention pattern and printed matter which gave forgery by the copying machine and the alteration prevention effect to the set pattern of music streaks, such as designs, such as negotiable securities, such as a bank note which needs copy prevention, a stock certificate, and a debenture, various certificates, and an important document, a **** pattern, and a relief pattern, with the printed matter which has the pattern of these ****s were able to be offered.

[0014] However, it is the present condition that it is becoming impossible for the copy preventive measure of the method of the above-mentioned **** to grow into sufficient forged preventive measure by advanced features of a color copying machine and the advancement of DTP (desktop publishing) technology by the end of today.

[0015] Then, in truth distinction, extensive and the machine reading inspection method which can carry out high-speed processing are widely adopted as solution of such a problem. Such technology in which the machine reading inspection method of today's printed matter detects the material by functional ink, such as a magnetic ink, infrared reflective absorption ink, and fluorescent ink, the fiber which forms print media, the quality of the material and chemicals, etc. originates in the specific electromagnetic wave which cannot be sensed to human being. There is much what is dependent on material aptitude when producing printed matter, and it can give only the product with which economical efficiency balances in a production cost side.

[0016] Moreover, there is the optical reading method for the pattern on the printed matter which can apply printing material like the ink for general printing which can carry out visible as a method of not taking into consideration especially the production cost of printed matter. As the comparatively easy optical reading method, although OCR, OMR, a bar code, a 2-dimensional code, etc. are well-known, when using these optical reading methods for the existing product, change of a design and specification is required.

[0017] Moreover, it is also the method which has appeared on the market in the city widely, and since these optical reading methods can carry out visible [of the sign] as a printing streak, the danger of decode and an alteration is also expected and they are inadequate as forgery and the alteration prevention method.

[0018] Furthermore, there is a series of technology generally called electronic watermark as a method of giving the information for reading, without similarly changing design nature, such as a design, by the optical reading method. An electronic watermark is also called concealed DOIMEJI and digital watermark, and is technology which embeds copyright information at the document file in the high performance copy technology and high performance DTP technology, or its printed matter as main uses. As well-known typical technology in printed matter, it is the method called frequency use type.

[0019] An electronic watermark is said for there to be little degradation of the frequency characteristic also in a duplicate object, and, recently, is given to the digital image distributed on the Internet for the purpose of protection of copyrights in many cases. Moreover, since the effect is done so also in printed matter, it has also been used for the poster etc. more often.

[0020] It is a continuous tone (photograph gradation) pattern that an electronic watermark can demonstrate an effect most. A continuous tone (photograph gradation) pattern is one of the technology in which many methods, such as not only a frequency use type but a pixel substitution type, a pixel space use type, a quantization error diffusion type, etc., are proposed since it is multiple-value image data and sufficient redundancy exists, and many reference and patent application also attract attention today.

[0021] However, since the set pattern of music streaks, such as a design used for negotiable securities, a **** pattern, and a relief pattern, is a binary picture fundamentally and there is little redundancy, embedding of an electronic watermark is made difficult, since the signal for reading is weak as a result, it reads, and the thing with a low precision has been a technical problem.

[0022] Therefore, development of the effective technology which can carry out truth distinction of a pattern that it has the forged prevention aptitude which is the forgery and the alteration prevention method independent of the material aptitude of printed matter, for example, is suitable for negotiable securities, such as a bank note, a stock certificate, and a debenture, various certificates, an important document, etc., by machine reading is desired.

EFFECT OF THE INVENTION

[Effect of the Invention] Although it cannot recognize with human being's visual sense according to this invention which consists of the above composition, it becomes it is possible to detect the embedded information and possible in digital instruments, such as a scanner and a copying machine, to analyze the information embedded by performing the operation of extraction of the Fourier transform and specific frequency, and an inverse Fourier transform on a digital instrument.

[0095] moreover, artistic effect ****** which a printing streak has since it is impossible to recognize the information with human being's visual sense also in monochrome printing in the streak used for this invention -- there are also nothings

[0096] moreover, since it consists of high streaks of regularity compared with embedding and the technology to read, the signal strength of the information will become very big, the invisibility information stated by the Prior art is read, and ** becomes easy

[0097] since it has the effect of these, this invention becomes effective in starting actions according the invisibility information given to a bank note, securities, various certificates, the important document, etc. to a digital instrument, such as an operation halt of a digital instrument based on [read and] ** and its information

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] this invention was made in view of the above-mentioned point, and it aims at embedding information in the printed matter which has art, such as securities which consist of line drawings for securities etc., by giving a modulation to the line drawing for securities on the level which human being cannot recognize visually, without spoiling the artistic effect. Moreover, in order to strengthen more the conventional information embedding and the signal of the information currently used in reading ******, it attains by performing division and branching processing to the line drawing for securities which has regularity.

MEANS

[Means for Solving the Problem] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, and constitute a basic streak group, and two or more above-mentioned fragmentation streak sections gather, and constitute a fragmentation streak group. It is the printed matter with which the information which consists of the above-mentioned basic streak group and the fragmentation streak section was embedded and in which truth distinction is possible. the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with the predetermined interval, the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the

above-mentioned thin streak is arranged in parallel, and is constituted. Based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section, the above-mentioned information offers the printed matter which is characterized by the identifiable thing and in which truth distinction is possible in the Fourier transform pattern which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and is obtained.

[0025] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. the thin streak of these two or more books It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, serve as a basic streak group, and constitute a background. It is the printed matter with which the information which two or more above-mentioned fragmentation streak sections gather, serve as a fragmentation streak group, constitutes the picture section, and consists of the above-mentioned background and the picture section was embedded and in which truth distinction is possible. the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with the predetermined interval, the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is arranged in parallel, and is constituted. It is based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section. the above-mentioned information The inside of the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained, The printed matter which is characterized by the identifiable thing in the picture from which the picture which only the picture field equivalent to frequency predetermined by the band pass filter is extracted, and is acquired carries out an inverse Fourier transform, and is acquired and in which truth distinction is possible is offered.

[0026] The above-mentioned part open circuit is characterized by being the length and line breadth of a grade to which the visual sense of the basic streak section and the fragmentation streak section is carried out by the same concentration.

[0027] In order that this invention may solve the above-mentioned technical problem, it has the line drawing which consists of two or more thin streaks. the thin streak of these two or more books It is the printed matter which consists of the fragmentation streak section which consists of the interval of two or more kinds, and constitutes predetermined information and in which truth distinction is possible. the fragmentation streak section of the interval of two or more [above] kinds With a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively is arranged in parallel, and is constituted. Based on correlation of the interval of each fragmentation line of the fragmentation streak section of the interval of two or more [above] kinds, the above-mentioned information offers the printed matter which is characterized by the identifiable thing and in which truth distinction is possible in the Fourier transform pattern which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and is obtained.

[0028] The above-mentioned thin streak is a straight line or a curve.

[0029] The above-mentioned thin streak has fixed regularity, and is characterized by being an artistic wavelike curve.

[0030] The above-mentioned thin streak is characterized by being the line of a closed system.

[0031] The above-mentioned part open circuit is characterized by being printed in ink which usually serves as a visible reflected wave length range under lighting.

[0032] The digital image data in which an output of the printed matter which has the line drawing for securities which consists of two or more thin streaks is possible in order that this invention may solve the above-mentioned technical problem are created. About each of two or more above-mentioned thin streaks in these digital image data By changing into the composition which consists of both or either of the basic streak sections and the above-mentioned fragmentation streak sections which replace the part or all in the fragmentation streak section, and do not transpose the above-mentioned thin streak to the fragmentation streak section, and which are a state It is the information embedding method of the printed matter which

embeds the information which consists of the basic streak group for which two or more above-mentioned basic streak sections gathered, and the fragmentation streak group for which two or more above-mentioned fragmentation streak sections gathered and in which truth distinction is possible. The part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with a predetermined interval, as two or more are arranged in parallel, it forms. Based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section, the above-mentioned information offers the information embedding method of the printed matter which is characterized by the identifiable thing and in which truth distinction is possible in the Fourier transform pattern which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and is obtained.

[0033] The digital image data in which an output of the printed matter which has the line drawing for securities which consists of two or more thin streaks is possible in order that this invention may solve the above-mentioned technical problem are created. About each of two or more above-mentioned thin streaks in these digital image data By changing into the composition which consists of both or either of the basic streak sections and the above-mentioned fragmentation streak sections which replace the part or all in the fragmentation streak section, and do not transpose the above-mentioned thin streak to the fragmentation streak section, and which are a state It is the information embedding method of the printed matter which embeds the information which consists of the background which consists of the basic streak group for which two or more above-mentioned basic streak sections gathered, and the picture section which consists of the fragmentation streak group for which two or more above-mentioned fragmentation streak sections gathered and in which truth distinction is possible. The part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak the above-mentioned fragmentation streak section Along with the longitudinal direction of the above-mentioned thin streak, mutually, with a predetermined interval, as two or more are arranged in parallel, it forms. It is based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section. the above-mentioned information The inside of the Fourier transform pattern with which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and they are obtained, The information embedding method of the printed matter which is characterized by the identifiable thing in the picture from which the picture from which only the picture field equivalent to frequency predetermined by the band pass filter is extracted and obtained carries out an inverse Fourier transform, and is acquired and in which truth distinction is possible is offered.

[0034] The digital image data in which an output of the printed matter which has the line drawing for securities which consists of two or more thin streaks is possible in order that this invention may solve the above-mentioned technical problem are created. About each of two or more above-mentioned thin streaks in these digital image data It replaces in the division streak section of one which was chosen from the division streak section of the interval of two or more kinds of kinds. Two or more above-mentioned thin streaks are the information embedding methods of the printed matter which embeds the information which consists of the division streak section of the interval of two or more kinds and in which truth distinction is possible. the division streak section of the interval of two or more [above] kinds With a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, as the part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively arranges two or more in parallel, it forms. It is based on correlation of the interval of each division line of the division streak section of the interval of two or more [above] kinds. The above-mentioned information offers the information embedding method of the printed matter which is characterized by the identifiable thing and in which truth distinction is possible in the Fourier transform pattern which the Fourier transform of the digital image data of the above-mentioned printed matter is carried out, and is obtained.

[0035] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the division streak section. Two or more above-mentioned basic streak sections gather, and constitute a basic streak group, and two or more above-

mentioned division streak sec[redacted] gather, and constitute a division streak [redacted]p. The information which consists of the above-mentioned basic streak group and a division streak group is embedded. the above-mentioned division streak section It is the truth distinction method of the printed matter in which truth distinction is possible that the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is mutually arranged in parallel with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes. Create the digital image data of the above-mentioned printed matter, carry out the Fourier transform of these digital image data, create a Fourier transform pattern, and it sets to this Fourier transform pattern. The truth distinction method of the printed matter which is characterized by discriminating the above-mentioned information from the above-mentioned basic streak group based on correlation of the interval of each streak of the division streak section and in which truth distinction is possible is offered.

[0036] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, serve as a basic streak group, and constitute a background. Two or more above-mentioned fragmentation streak sections gather, and serve as a fragmentation streak group, the picture section is constituted, and the information which consists of the above-mentioned background and the picture section is embedded. the above-mentioned fragmentation streak section It is the truth distinction method of the printed matter in which truth distinction is possible that the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is mutually arranged in parallel with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes. Create the digital image data of the above-mentioned printed matter, and carry out the Fourier transform of these digital image data, and a Fourier transform pattern is created. In the picture acquired by carrying out the inverse Fourier transform of the picture from which only the picture field which is equivalent to frequency predetermined by the band pass filter among the above-mentioned Fourier transform patterns is extracted and obtained The truth distinction method of the printed matter which is characterized by discriminating the above-mentioned information from the above-mentioned basic streak group based on correlation of the interval of each streak of the fragmentation streak section and in which truth distinction is possible is offered.

[0037] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. the thin streak of these two or more books It consists of the fragmentation streak section of the interval of two or more kinds, and predetermined information is constituted. the fragmentation streak section of the interval of two or more [above] kinds It is prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively, and the same fragmentation line of length as the width of face of the above-mentioned thin streak It is the truth distinction method of the printed matter which is arranged in parallel two or more with a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, and changes and in which truth distinction is possible. Read the above-mentioned printed matter electronically, create digital image data, carry out the Fourier transform of these digital image data, create a Fourier transform pattern, and it sets to this Fourier transform pattern. Based on correlation of the interval of each fragmentation line of the fragmentation streak section of the interval of two or more [above] kinds, the truth distinction method of the printed matter which is characterized by discriminating the above-mentioned information and in which truth distinction is possible is offered.

[0038] It is characterized by losing the anisotropy of the above-mentioned Fourier transform pattern, and discriminating the above-mentioned information as compared with the reference value beforehand set up in the intensity based on correlation of the above-mentioned position.

[0039] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, and constitute a basic streak group, and two or more above-mentioned fragmentation streak sections gather, and constitute a fragmentation streak group. The information

which consists of the above-mentioned basic streak group and a fragmentation streak group is constituted. the above-mentioned fragmentation streak section It is truth distinction equipment of the printed matter with which the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively is arranged in parallel, is mutually constituted with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes and in which truth distinction is possible. Have a means to create the digital image data of the above-mentioned printed matter, and a means to carry out the Fourier transform of these digital image data, and to create a Fourier transform pattern, and it sets to the above-mentioned Fourier transform pattern. Based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section, the truth distinction equipment of the printed matter which is characterized by making the above-mentioned information identifiable and in which truth distinction is possible is offered.
[0040] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. this thin streak It consists of either [either / both or] the basic streak section which is one line, respectively, and the fragmentation streak section. Two or more above-mentioned basic streak sections gather, serve as a basic streak group, and constitute a background. Two or more above-mentioned fragmentation streak sections gather, and serve as a fragmentation streak group, the picture section is constituted, and the information which consists of the above-mentioned background and the picture section is embedded. the above-mentioned fragmentation streak section It is truth distinction equipment of the printed matter with which the-two or more part open circuit prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak is arranged in parallel, is mutually constituted with a predetermined interval along with the longitudinal direction of the above-mentioned thin streak, and changes and in which truth distinction is possible. A means to create the digital image data of the above-mentioned printed matter, and the means which carries out the Fourier transform of these digital image data, and carries out a Fourier transform pattern, In the picture which extracted only the picture field which is equivalent to frequency predetermined by the band pass filter among the above-mentioned Fourier transform patterns, is equipped with a means to create the picture which carried out the inverse Fourier transform of this, and carried out [above-mentioned] the inverse Fourier transform Based on correlation of the interval of each streak of the above-mentioned basic streak group and the fragmentation streak section, the truth distinction equipment of the printed matter which is characterized by making the above-mentioned information identifiable and in which truth distinction is possible is offered.
[0041] In order that this invention may solve the above-mentioned technical problem, it has the line drawing for securities which consists of two or more thin streaks. the thin streak of these two or more books It consists of the fragmentation streak section which consists of the interval of two or more kinds, and predetermined information is constituted. the fragmentation streak section of two or more [above] kinds It is prolonged in the direction which intersects perpendicularly with the longitudinal direction of the above-mentioned thin streak, respectively, and the same fragmentation line of length as the width of face of the above-mentioned thin streak A means to be arranged in parallel two or more with a predetermined interval which is different for every above-mentioned kind along with the longitudinal direction of the above-mentioned thin streak, and to be truth distinction equipment of the printed matter which is constituted and changes and in which truth distinction is possible, and to read the above-mentioned printed matter electronically and to create digital image data, Have a means to carry out the Fourier transform of these digital image data, and to create a Fourier transform pattern, and it sets to the above-mentioned Fourier transform pattern. Based on correlation of the interval of each fragmentation line of the fragmentation streak section of two or more [above] kinds, truth distinction ****** of the printed matter which is characterized by making the above-mentioned information identifiable and in which truth distinction is possible is offered.
[0042]
[Embodiments of the Invention] The gestalt of operation of this invention is explained to a detail below with reference to a drawing based on an example. Two or more streaks containing the straight line (direct 10,000 lines) and curve of 10,000 lines gather, and the line drawing for securities currently used for securities, the bill, etc. consists of geometric designs. The streak used as the element which constitutes such a line drawing for securities is called "thin streak" by this invention. In the line drawing for securities, very high regularity exists in the interval of two or more thin streaks etc. this invention noted the point as a means to evaluate this

regularity that a means to eva[redacted]correlation of the interval of two or mo[redacted]in streaks of the line drawing for securities was effective.
[0043] In digital instruments, such as a scanner and a copying machine, although two or more thin streaks of the line drawing for securities in which especially this invention has this regularity are identifiable The portion with recognition difficult for human being with a visual sense which has detailed and regularity is given. Correlation of the interval of the line drawing for securities is analyzed on a digital instrument to the obtained printed matter, truth distinction is possible by discriminating the information embedded at printed matter, and actions, such as a halt of digital instruments, such as a copying machine used for forgery etc. based on the information, of operation, are made possible.
[0044] As composition which gives a modulation to the line drawing for securities on the level which cannot be recognized with human being's visual sense, this invention persons The composition which is made to divide the thin streak which constitutes the line drawing for securities, arranges in parallel two or more fragmentation lines which changed the length and width of face in the center line of the thin streak of the line drawing for securities and the direction which goes direct of human being in the direction of a thin streak so that it may look it visually that the concentration of the fragmentation section and the non-dividing section is equivalent, and embeds information It proposes in this invention. Moreover, technique with the same said of the branching streak which branched the line drawing for securities in the parallel direction can be used.
[0045] The information embedded using the line drawing for securities which consists of two or more thin streaks has the regularity of the line drawing for securities, and two parameters which in other words are called the fixed interval and the position to embed of two or more thin streaks of the line drawing for securities. Thus, in order to discriminate the embedded information, after acquiring correlation of the interval of two or more thin streaks of the line drawing for securities by the Fourier transform, it is made by extracting only correlation of a specific position or the specific direction, or performing an inverse Fourier transform further. Therefore, the information from which the embedded information differs according to correlation of a position or a direction will be acquired. Examples 1-7 explain this concretely below.
[0046] (Example 1) Drawing 1 -7 are drawing for explaining an example 1. Drawing 1 is printed matter which consists of direct 10,000 lines 2 (it is equivalent to the "thin streak" of this invention) which have the simple fixed interval db, and explains the method of embedding one kind of information, the printed matter formed of this and the method of recognizing this printed matter, and equipment to this printed matter.
[0047] The printed matter shown in drawing 1 is read with digital instruments, such as a scanner, and it considers as digital image data, such as bit map data. Or you may create direct digital image data by computer. make it any -- if this digital image data carries out the printout of it, the printed matter which has two or more direct 10,000 lines 2 (10,000 -- it has two or more thin streaks in a line) will be created These direct 10,000 lines are expressed with the following formula 1 on xy coordinate.
[0048]
[Formula 1]

$$y = x + 2^{1/2} n d_b$$

[0049] Here, -2, -1, 0, 1 and 2, --db are n=-- and an interval between direct 10,000 line 2.
[0050] In this invention, the binary picture (information) which becomes direct 10,000 lines 2 expressed with the formula 1 in drawing 1 from the picture section 3 and the background 4 like drawing 2 is embedded. Specifically, in drawing 3 , the portion which is in the field of the picture section 3 among direct 10,000 lines 2 is replaced so that it may constitute from the fragmentation streak section 1. The background 4 is taken as the portion with direct 10,000 lines 2 which have the fixed interval db of a basis (basic streak section 5).
[0051] Two or more fragmentation lines 6 with difficult recognition with human being's visual sense maintain the fixed interval dd in the direction of direct 10,000 lines 3, and this fragmentation streak section 1 is arranged in parallel in the direction of direct 10,000 lines 2. Two or more fragmentation lines 6 are arranged in the direction which intersects perpendicularly to the longitudinal direction of direct 10,000 lines 2, respectively, and with human being's visual sense, they set up the width of face and length of the fragmentation line 6 so that it may become equivalent to the concentration of the basic streak section 5 (direct 10,000 lines 2). Direct 10,000 lines 2 of drawing 3 and the part open circuit 6 are expressed with a formula 2 and a formula 3.

[0052]
[Formula 2]

$$y = F_b\ (x,\ y)\ \ (x + 2^{1/2} n_b d_b)$$

[0053]
[Formula 3]

$$x = F_d\ (x,\ y)\ G_d\ (x,\ y)\ \ (-y + 2^{1/2} n_d d_d)$$

[0054] In the field which embeds the information used as the picture section 3, Fb (x y) and Fd (x y) of a formula 2 and a formula 3 are set to Fb(x y) =0 and Fd(x y) =1, on the other hand, in the field used as a background 4, are set to Fb(x y) =1 and Fd(x y) =0, and mean the form factor of a picture. Moreover, nb and nd are the integers made independent, respectively. Moreover, Gd (x y) is a function showing a fragmentation line, and it is the function which shows 1 by the fragmentation line part and shows 0 in the fracture section.
[0055] The portion which is equivalent to the field of the picture section 3 of two or more direct 10,000 lines 2 as mentioned above by replacing in the fragmentation streak section 1 direct 10,000 lines 2 (thin streak) Consisting of either [either / both or] the basic streak section 5 and the fragmentation streak section 1, two or more above-mentioned basic streak sections 5 gather, serve as a basic streak group, constitute a background 4, and two or more above-mentioned fragmentation streak sections 1 gather, serve as a fragmentation streak group, and they constitute the picture section 3 (figure).
[0056] And if a basic streak group and a fragmentation streak group serve as the composition of having different frequency based on each streak interval, and having the line drawing for securities where the information which moreover consists of a background 4 and the picture section 3 was embedded and the printout of this is carried out, the printed matter concerning this invention in which truth distinction is possible is constituted.
[0057] Thus, the means and method of discriminating the information on the printed matter which embedded information are explained. The above-mentioned printed matter is read by reading ******, such as a scanner, and reading ****** is held as bit map data (it is an example of the "digital image data" of this invention.). And the Fourier transform of this bit map data is carried out. If this is expressed with a formula 4, it will become as follows.
[0058]
[Formula 4]

$$I\ (\underline{q}) = \int \rho\ (\underline{r})\ \rho\ (\underline{q} - \underline{r})\ \exp\ (-i$$

[0059] Here, rho (r) means correlation intensity [in / q of the Fourier transform from which q can obtain the density function of a streak and I (q) is obtained / radius vector / from a reference point] in a reciprocal space vector / in r], respectively.
[0060] Drawing 4 is a Fourier transform pattern with which the Fourier transform of the printed matter of drawing 3 is carried out, and it is obtained. Two kinds of strong correlation is observed by drawing 4 . Such frequency qb and frequency qd correspond to the interval db of direct 10,000 lines 2, the interval dd of the part open circuit 6, and correlation of a position, respectively. In short, the correlation of each interval based on the interval db of a basic streak group and the interval dd of a fragmentation streak group is observed as frequency qb and frequency qd in a Fourier transform pattern, and the information embedded by the picture shown as this strong correlation can be discriminated.
[0061] And the embedded information extracts information from the Fourier transform pattern of drawing 4 since corresponding to correlation of the interval of the interval dd of the fragmentation line 6 using the band pass filter which extracts only frequency qd like drawing 5 using the following formula 5.
[Formula 5]

$$I_f\ (\underline{q}) = f\ (q)\ \ I\ (\underline{q})$$

[0062] Here, in q=qd, f (q) is set to f(q) =1, and, in q!=qd, is set to f(q) =0. Moreover, If (q) means the

correlation intensity in q of th[redacted]urier pattern after the streak extraction [redacted]e band pass filter. The inverse Fourier transform of the extraction result is expression **** at the following formula 6.
[Formula 6]

$$\rho_d(\underline{r}) = \int I_f(\underline{q})\ I_f(\underline{r}-\underline{q})\ \exp(-i\,\underline{r}\cdot\underline{q})\ d\underline{q}$$

[0063] Thus, if an inverse Fourier transform is carried out, two or more division lines 6 which have a fixed interval as shown in drawing 6 will appear the result, and the picture section 3 in original drawing 2 and a similar thing will be obtained. The embedded information can be discriminated by this picture that carried out the inverse Fourier transform.
[0064] Drawing 7 is drawing showing the interval of the basic streak section of the background and the picture section which lose an anisotropy and are obtained from the Fourier transform pattern of the bit map data which read with the scanner etc. the printed matter in which the above-mentioned truth distinction is possible, and were obtained, and a division line, and the position correlation intensity based on a difference of a position. By this drawing 7 (2), truth distinction of printed matter is attained by a single dimension estimating the big intensity more than fixed, and discriminating it with the position correlation intensity I. According to this, it becomes discriminable [the information embedded even if it did not perform the extraction and the inverse Fourier transform of specific frequency by the above band pass filters].
[0065] (Example 2) Drawing 8 -12 are drawing explaining an example 2. Drawing 8 is the same means as an example 1, and shows the printed matter which is constituted by embedding information and in which truth distinction is possible to the printed matter which consists of two or more 10,000 lines 11 (it is equivalent to the "thin streak" of this invention.) which vibrate wavelike a fixed period.
[0066] The fragmentation streak section 10 to which it consists of basic streak groups which consist of two or more 10,000 lines 14 (basic streak section 14) by which a background 12 vibrates wavelike [an interval db], and the picture section 15 changes from two or more fragmentation lines 17 of an interval dd to the longitudinal direction of 10,000 lines 11 is constituted from the fragmentation streak group which gathered by the printed matter of an example 2. 10,000 lines 14 and the part open circuit 17 which are shown in drawing 8 and which vibrate wavelike are expressed with a following formula 7 and a following formula 8.
[0067]
[Formula 7]

$$y = F_b(x, y)\ \{A \sin(\omega x) + 2^{1/2} n d_b\}$$

[0068]
[Formula 8]

$$x = F_d(x, y)\ G_d(x, y)\ (-y + 2^{1/2} n_d d_d)$$

[0069] Here, A and omega mean the amplitude given in order to give an oscillating modulation to direct 10,000 lines which are the base units of the printed matter of an example 1, and its frequency. The picture acquired by reading with a scanner etc. the printed matter shown in drawing 8 , using reading ****** as bit map data, and carrying out the Fourier transform of this is shown in drawing 9 .
[0070] The peak of qb-qb+deltab and qd-delta d- - qd+delta d+ correlation has expanded drawing 9 broadly, respectively from the frequency qb corresponding to position correlation of the interval db of 10,000 lines 14 which vibrate as compared with drawing 4 of an example 1, and the frequency qd corresponding to position correlation of the interval dd of the part open circuit 17. 10,000 lines 14 are wavelike curves and this originates in arranging on 10,000 lines 14 whose fragmentation lines 17 are this wavelike curve.
[0071] If this is explained in the important section enlarged view 10 of drawing 8 , the interval 26 by the side of **** of the fragmentation line 24 and the fragmentation line 25 is short compared with the basic interval 27 (interval dd), for example. Although illustration is not carried out, in the reverse, i.e., ****, side, the interval of a fragmentation line and a fragmentation line is long compared with the basic interval (interval dd).
[0072] In order to discriminate the information embedded in the example 2 <A To HREF="/Tokujitu/tjitemdrw.ipdl?N0000=239&N0500=1 E_N/;>:=??9;8///&N0001=123&N0552=9&N0553=000020" TARGET="tjitemdrw"> drawing 9 Although

you may observe in the feature [redacted] shown Fourier transform pattern, a Fo[redacted] transform pattern is received. It is deltad to the frequency qd from frequency qd. - In the range (namely, frequency range from qd-delta d- to qd+deltad+) of the frequency which added deltad+ to the reduced frequency and qd, using the band pass filter of the property shown in a formula 9, as shown in drawing 11 , it extracts.
[0073]
[Formula 9]

$$I_f(q) = f(q)\ I(q)$$

[0074] In qd-delta d-<= q<=qd+delta d+, in a formula 9, f (q) is set to f(q) =1, and, in qd+deltad+<q or q<qd-delta d-, is set to f(q) =0.
[0075] A picture as shows the picture acquired through the above-mentioned band pass filter to drawing 12 by performing an inverse Fourier transform is acquired. this picture **** -- the information embedded at the printed matter in which truth distinction is possible becomes possible [reading as the picture section 15] In addition, the picture acquired by this ********** can acquire still clearer information by eliminating the noise which has a value below fixed intensity to the intensity of each pixel.
[0076] (Example 3) Drawing 13 shows the printed matter in which truth distinction of the example 3 of this invention is possible. Although the printed matter concerning an example 1 showed the line drawing for securities from which ends replace direct 10,000 lines in the line drawing for securities which consists of two or more direct 10,000 lines (thin streak) which are open systems in the fragmentation streak section which consists of two or more fragmentation lines, embed information, and are obtained The printed matter concerning an example 3 shows the line drawing for securities which replaced the concentric circle 28 in the fragmentation streak section 34 which consists of two or more fragmentation lines 33, and embedded information in the line drawing for securities which consists of two or more concentric circles 28 (it is equivalent to the thin streak of this invention) which are closed systems.
[0077] That is, the background 28 of the information embedding the printed matter shown in drawing 13 is constituted from a basic streak group which consists of two or more basic streak sections 30 of an interval db, and constitutes the picture section 31 from a fragmentation streak group which is a set of the fragmentation streak section 34 which consists of two or more fragmentation lines 33 of an interval dd.
[0078] The Fourier transform pattern shown in drawing 14 is obtained by reading this printed matter with a scanner etc. like an example 1, using it as bit map data, and carrying out the Fourier transform of this. The information where printed matter was embedded by the feature of this Fourier transform pattern is discriminable.
[0079] Furthermore, in drawing 14 , it extracts from the interval dd of the fragmentation line 33, and the frequency qd corresponding to position correlation by the band pass filter like an example 2 about the range which adjusted frequency deltad in frequency qd, and an inverse Fourier transform is performed to this extraction result. Consequently, the picture which has ****** by which two or more fragmentation lines 33 of the interval dd as shown in drawing 15 are equivalent to the fragmentation streak section and the picture section 31 which constitutes a fragmentation streak group further and changes can be acquired. It becomes discriminable [the information embedded by this picture].
[0080] (Example 4) Drawing 19 -21 are drawing explaining an example 4. Although this example 4 is a closed system like an example 3, it is printed matter which embeds information at the line drawing for securities which modulates two or more concentric circles on 10,000 lines (thin streak) of a closed system which vibrate wavelike, and is obtained, and grows into it and in which truth distinction is possible.
[0081] That is, it consists of basic streak groups which consist of two or more basic streak sections 44 by which the background 43 was arranged at intervals of db at the printed matter shown in drawing 19 , the picture section 45 consists of fragmentation streak groups in which the fragmentation streak section 42 which consists of two or more fragmentation lines 46 arranged at intervals of dd comes to gather, and it is the composition that the information which consists of these backgrounds 43 and picture sections 45 was embedded.
[0082] The Fourier transform pattern concerning this printed matter is as being shown in drawing 20 . In drawing 20 , a band pass filter extracts from the interval dd of the fragmentation line 46, and the frequency qd corresponding to correlation of a position like an example 2 in the range which reduced the range and

deltad- which added frequency [redacted]ad+ to frequency qd, and an inverse Fo[redacted]r transform is performed to this extraction result. Consequently, as shown in drawing 21 , the picture which has the figure in which two or more fragmentation lines 46 of an interval dd are equivalent to the fragmentation streak section and the picture section 45 which constitutes a fragmentation streak group further and changes can be acquired. It becomes discriminable [the information embedded by this picture].

[0083] (Example 5) Drawing 22 -26 are drawing explaining an example 5, and an example 5 is characterized by the composition where two kinds of pictures are embedded as information to the line drawing for securities. Specifically, as an example 2 shows to drawing 22 , it is the composition which embeds the picture "B" as embedding information in the picture "A", and the picture section b at the picture section a.

[0084] Drawing 23 arranges and constitutes information by turns at the line drawing for securities of a concentric circle in the line drawing for securities which consists of a concentric circle (it is equivalent to the thin streak of this invention.) by the fragmentation line 48 which set the interval 47 as 163 micrometers at the basic streak section 54 which set the interval 53 as 400 micrometers at the background 52, and the picture section a, and the fragmentation line 50 which set the interval 49 as 114 micrometers at the picture section b.

[0085] The printed matter shown in drawing 23 is read with a scanner, and the Fourier transform pattern obtained by carrying out the Fourier transform of this is as being shown in drawing 24 as bit map data. By this Fourier transform pattern, the frequency qb corresponding to correlation of an interval, the frequency qd1 corresponding to correlation with an interval [of the interval 47 of the fragmentation line 48] of 163 micrometers, and the frequency qd2 corresponding to 114 micrometers of the interval 49 of the fragmentation line 50 are observed by 400 micrometers of the interval 53 of the basic streak section 54.

[0086] If an inverse Fourier transform is similarly performed to the extraction result using band pass filter a' with the example 4 having explained in the range which subtracted the range and deltad- which added frequency deltad+ to frequency qd1 from frequency qd1 as furthermore shown in drawing 25 , the picture "A" can be recognized like picture a." If similarly an inverse Fourier transform is performed from frequency qd2 to the extraction result using band pass filter b' in the range which reduced the range and deltad- which added frequency deltad+ to frequency qd2 as shown in drawing 26 , the picture "B" can be recognized like picture b."

[0087] (Example 6) Although it aims at grant of the image information as a two-dimensional pattern in the above-mentioned example, in order to make the printed matter specification method simple, it is not necessary to recognize as information as a two-dimensional pattern in printed matter in reading ******. That is, it is good also as composition which specifies the printed matter when it has correlation of the interval of a streak characteristic of printed matter, and enables truth distinction.

[0088] For example, the composition of the method of embedding two or more information using the **** element 36 which is the example of the line drawing for securities as shown in general drawing 16 , and its printed matter is explained. It replaced and constituted from the fragmentation streak section 35 which consists of two or more fragmentation lines 38 which drawing 17 set two or more thin streaks which constitute the **** element 36 of drawing 16 , and set the interval 37 as 163 micrometers every other, and the fragmentation streak section 41 which consists of two or more fragmentation lines 40 which set the interval 39 as 114 micrometers.

[0089] The Fourier transform pattern obtained by using as bit map data the picture shown in drawing 16 , and carrying out the Fourier transform of this is as being shown in drawing 27 . The Fourier transform pattern obtained by using as bit map data the picture furthermore shown in drawing 17 , and carrying out the Fourier transform of this is as being shown in drawing 18 . When it compares with drawing 27 in this drawing 18 , the frequency qd1 corresponding to correlation with an interval [of the interval 37 of the fragmentation line 38] of 163 micrometers and the frequency qd2 corresponding to 114 micrometers of the interval 39 of a fragmentation line are observed.

[0090] And when the anisotropy of the Fourier transform pattern to the bit map data at the time of printed matter ****** is lost and a single dimension estimates, as shown in drawing 7 It compares with drawing 7 (1) of single dimension evaluation of Fourier transform pattern drawing 27 which has not given the fragmentation line 38 and the part open circuit 40. At drawing 7 (2) of single dimension evaluation of Fourier transform pattern drawing 18 which has given the fragmentation line 38 and the part open circuit 40, specification of printed matter is attained by discriminating the big intensity more than fixed with an interval

and the position correlation inter[redacted]. That is, if the correlation intensity Iq[redacted]e interval of the frequency qd1 of the Fourier transform pattern of bit map data and frequency qd2 is mo[redacted]han fixed, printed matter can recognize that they are specific securities, and can demonstrate the forged prevention effect.
[0091] Moreover, if it is set as the place which is not influenced of the frequency qd1 of a Fourier transform result, and the frequency by correlation of the high order interval of frequency qd2 each like an example 5, recognition precision can be raised more. According to the discernment means as shown in drawing 7 , the process of extraction of the specific frequency by the band pass filter and this extracted inverse Fourier transform of a picture becomes unnecessary.
[0092] (Example 7) It prints in ink in which the reflected wave length range under lighting is usually set to 600 to 700nm in the element which embeds information at printed matter. In this case, if reading ****** is equipped with the filter which penetrates only 600 to 700nm light, it will become possible for many elements on other printed matter to be removed by the filter, and to remove an unnecessary noise. Consequently, it becomes possible to enlarge the informational intensity and the ratio of a noise pass extraction by the Fourier transform and the band pass filter, and an inverse Fourier transform.
[0093] As mentioned above, although the gestalt of operation of this invention was explained based on the example, it cannot be overemphasized by this invention that there are various examples within the limits of the technical matter which is not limited to such an example and indicated by the claim.

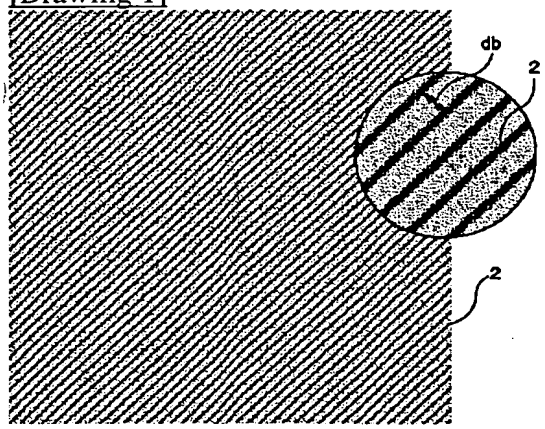
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing for explaining an example 1, and the printed matter which consists of direct 10,000 lines which have a fixed interval is shown.
[Drawing 2] It is drawing explaining the figure of the picture section of the printed matter of an example 1.
[Drawing 3] It is drawing explaining the printed matter of an example 1.
[Drawing 4] It is drawing showing the Fourier transform pattern of the printed matter of an example 1.
[Drawing 5] It is drawing explaining extraction by the band pass filter concerning an example 1.
[Drawing 6] It is drawing showing the picture acquired by the inverse Fourier transform in the Fourier transform pattern of an example 1 after letting the band pass filter pass.
[Drawing 7] It is drawing showing the correlation intensity of the interval which loses an anisotropy and is obtained from the Fourier transform pattern of printed matter.
[Drawing 8] It is drawing explaining the printed matter of an example 2.
[Drawing 9] It is drawing showing the Fourier transform pattern of the printed matter of an example 2.
[Drawing 10] The important section enlarged view of drawing 8 is shown.
[Drawing 11] It is drawing explaining extraction by the band pass filter concerning an example 2.
[Drawing 12] It is drawing showing the picture acquired by ********** in the Fourier transform pattern of an example 2 after letting the band pass filter pass.
[Drawing 13] It is drawing explaining the printed matter of an example 3.
[Drawing 14] It is drawing showing the Fourier transform pattern of the printed matter of an example 3.
[Drawing 15] It is drawing showing the picture acquired by ********** in the Fourier transform pattern of an example 3 after letting the band pass filter pass.
[Drawing 16] It is drawing showing the general **** element used as a line drawing for securities.
[Drawing 17] It is drawing explaining the printed matter of an example 6.
[Drawing 18] It is drawing showing the Fourier transform pattern of the printed matter of an example 6.
[Drawing 19] It is drawing explaining the printed matter of an example 4.
[Drawing 20] It is drawing showing the Fourier transform pattern of the printed matter of an example 4.
[Drawing 21] It is drawing showing the picture acquired by ********** in the Fourier transform pattern of an example 4 after letting the band pass filter pass.
[Drawing 22] It is drawing explaining the printed matter of an example 5, and is drawing showing two

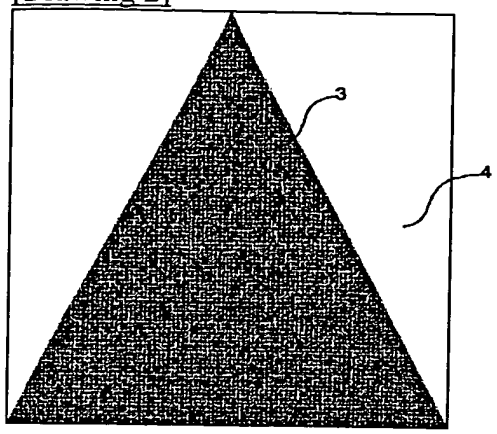
different figures embedded.
[Drawing 23] It is drawing explaining the printed matter of an example 5.
[Drawing 24] It is drawing showing the Fourier transform pattern of an example 5.
[Drawing 25] It is drawing showing the picture from which the inverse Fourier transform was extracted and carried out, and the filter of the band pass filter of the Fourier transform pattern of an example 5 was obtained.
[Drawing 26] It is drawing showing the picture from which the inverse Fourier transform was extracted and carried out, and the filter of the band pass filter of the Fourier transform pattern of an example 5 was obtained.
[Drawing 27] It is drawing showing the Fourier transform pattern of the general **** element which has not performed fragmentation processing.
[Description of Notations]
1, 10, 34, 35, 41, 42 Fragmentation streak section
2 Direct 10,000 Line
3, 15, 31, 45 Picture section
4, 12, 43, 52 Background
5, 14, 30, 44, 54 Basic streak section
6, 17, 24, 25, 33, 38, 40, 46, 48, 50 Fragmentation line
11 10,000 Lines
18 Amplitude
19 Frequency
26, 37, 39, 47, 49, 53 Interval
27 Interval Used as Foundations of Fragmentation Line
28 Concentric Circle (Thin Streak)
36 **** Element

DRAWINGS

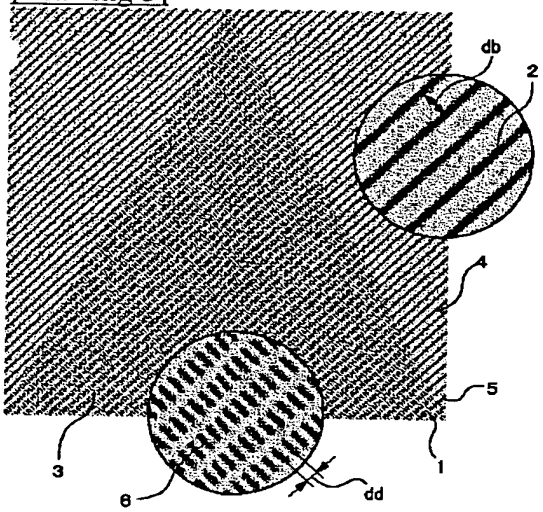
[Drawing 1]



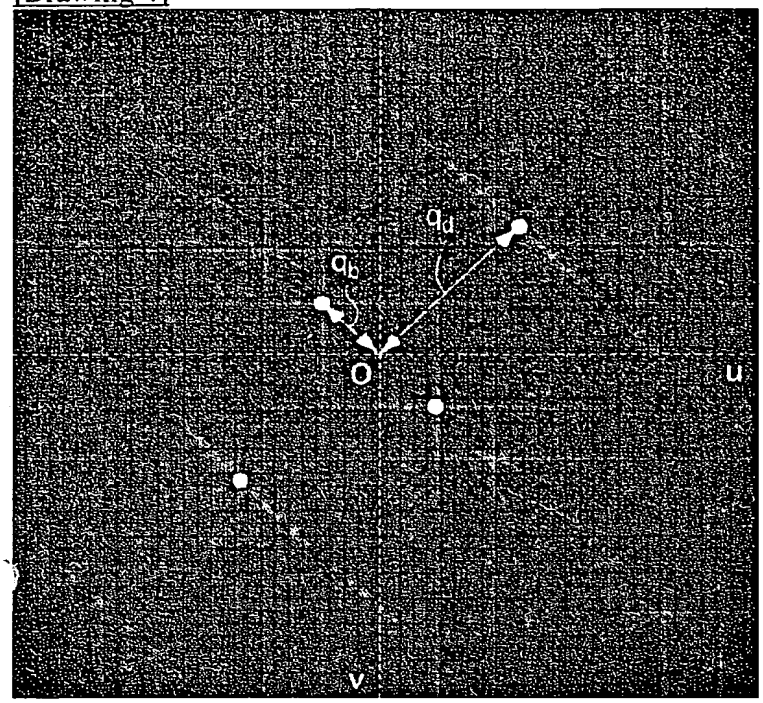
[Drawing 2]



[Drawing 3]



[Drawing 4]



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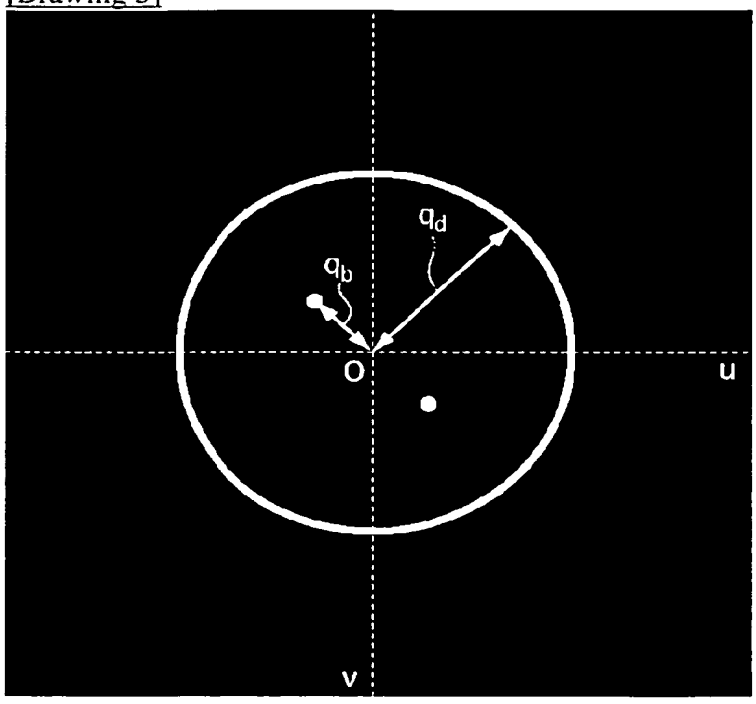
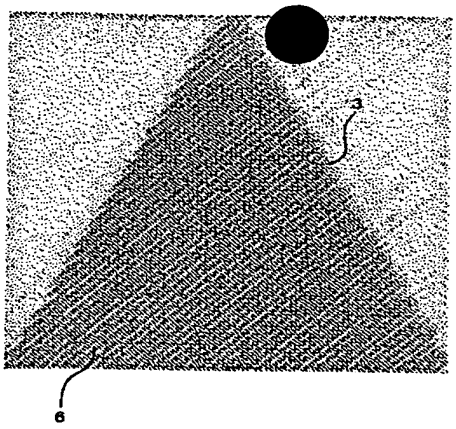
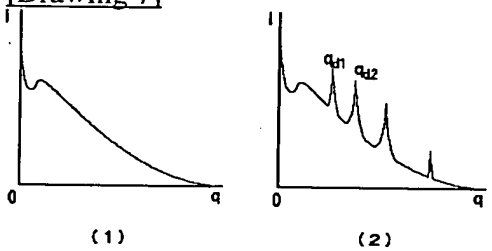


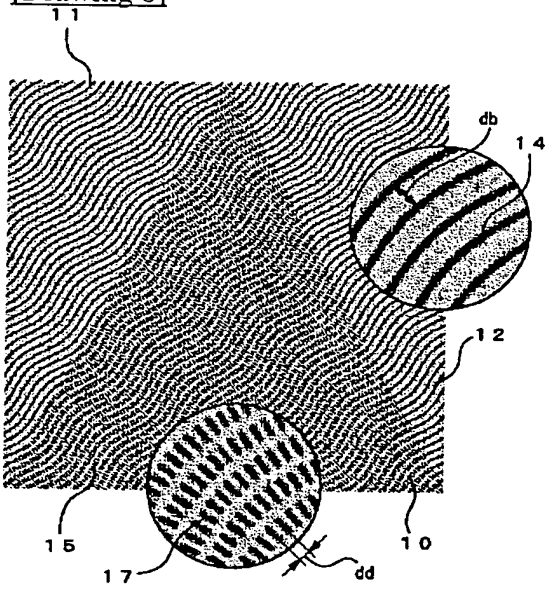


[Drawing 6]

[Drawing 7]



[Drawing 8]



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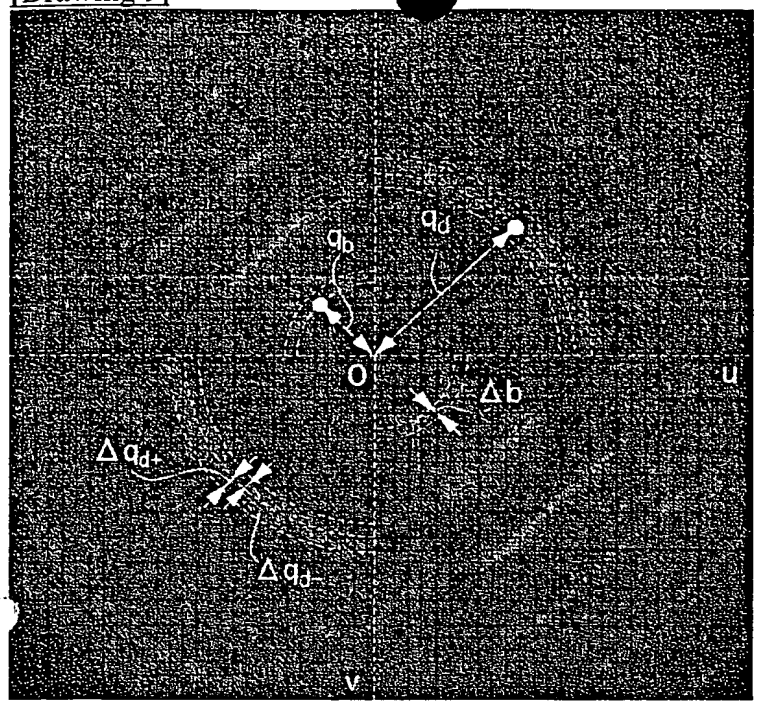
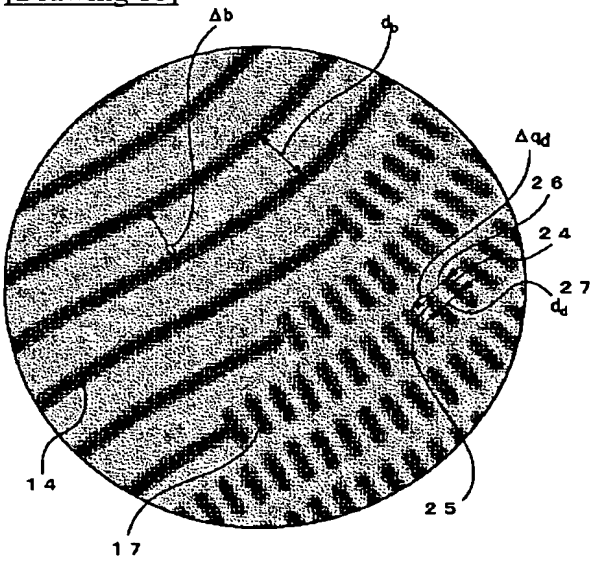
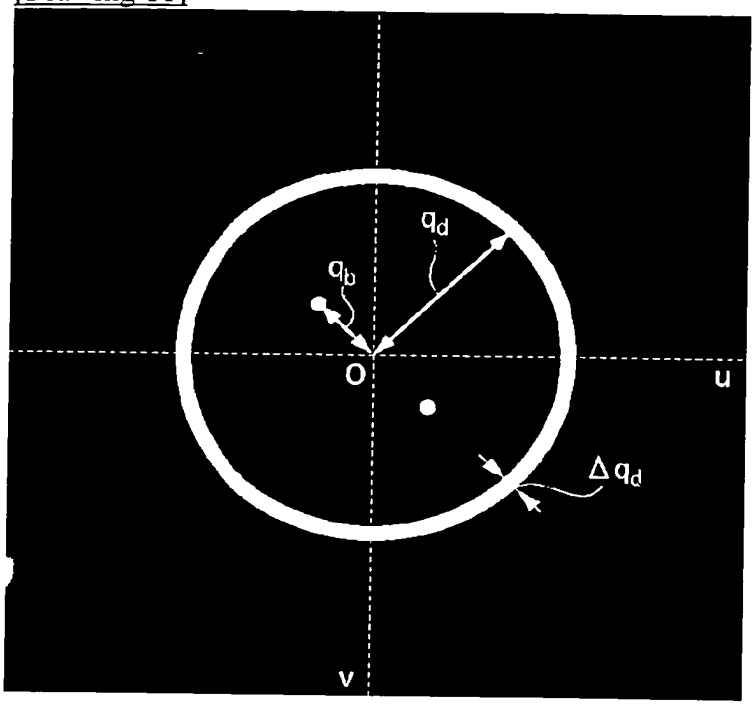


[Drawing 10]



[Drawing 11]



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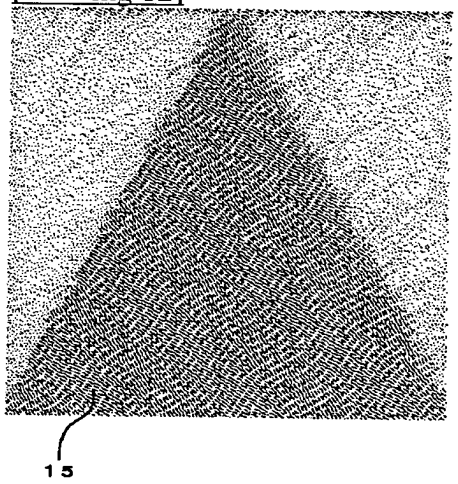
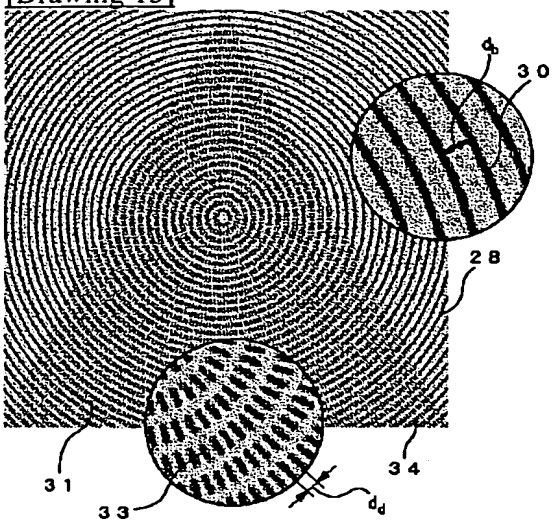


[Drawing 13]



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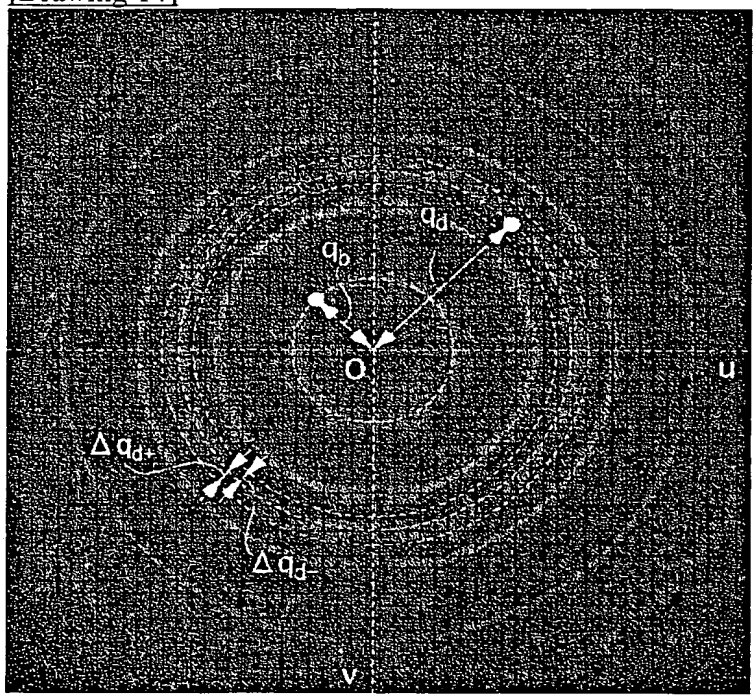

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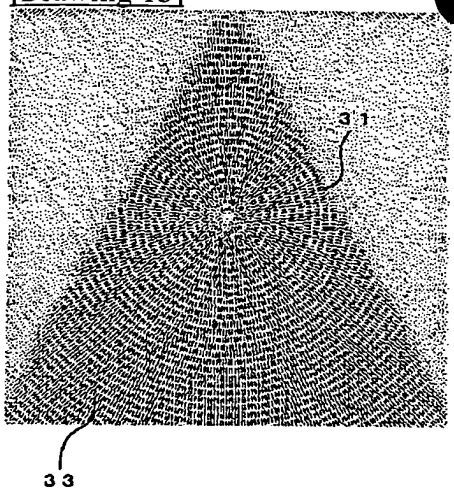

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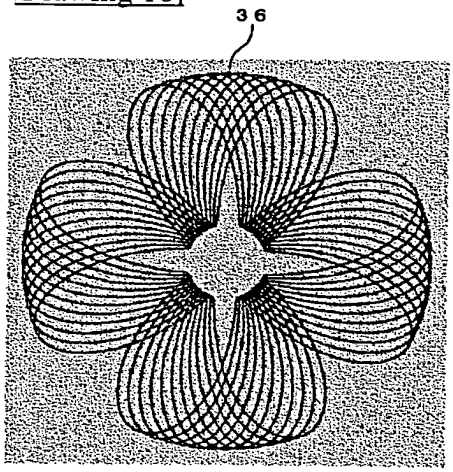
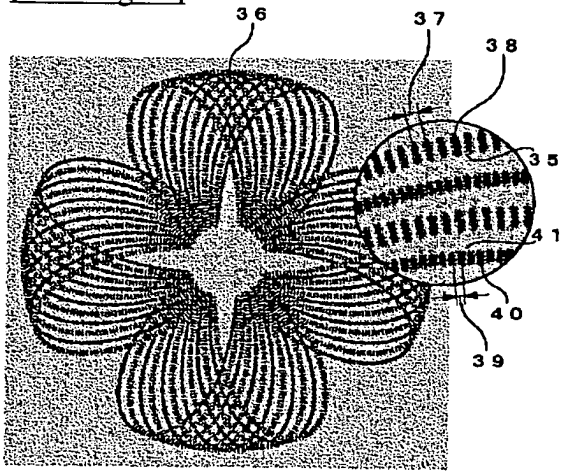
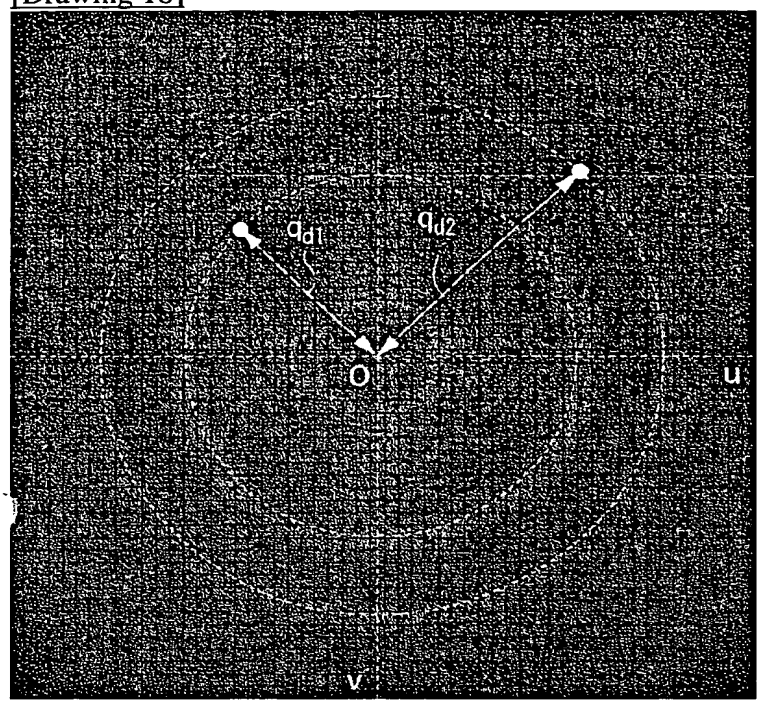


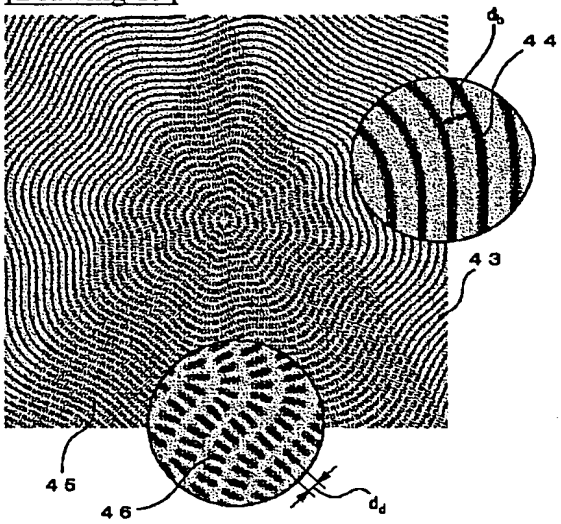
[Drawing 17]



[Drawing 18]



[Drawing 19]



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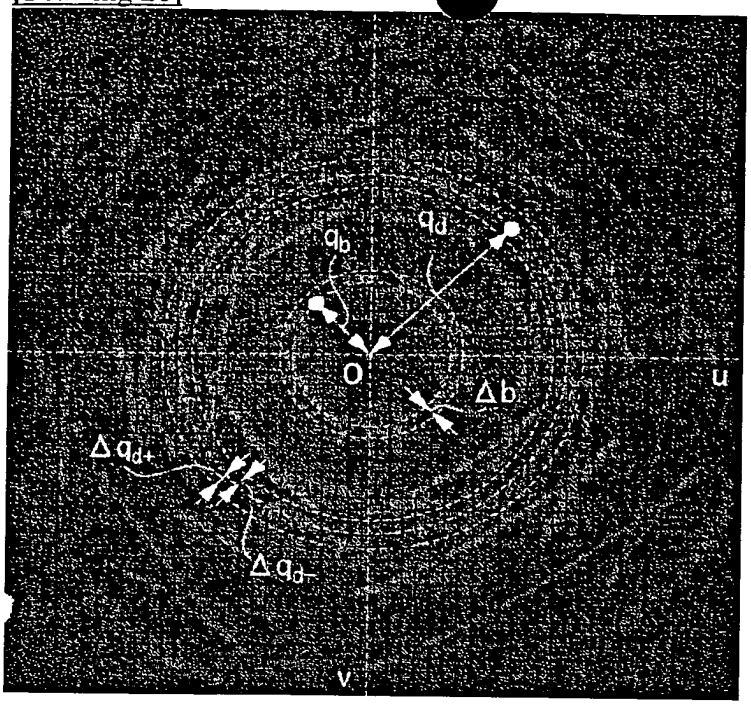
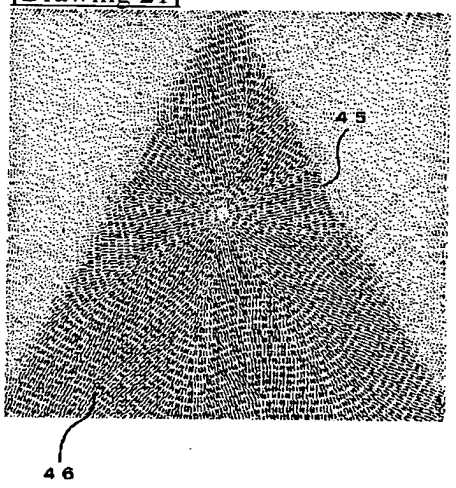


[Drawing 21]



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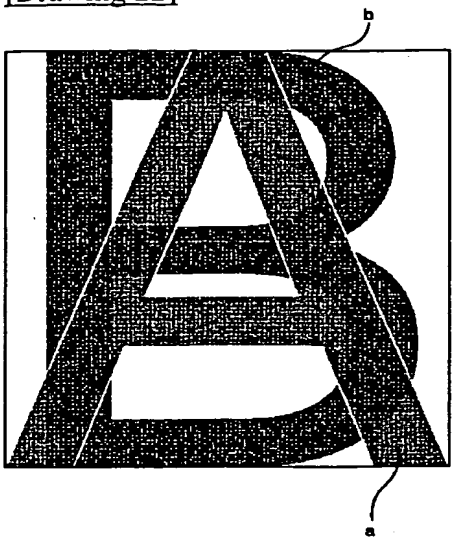

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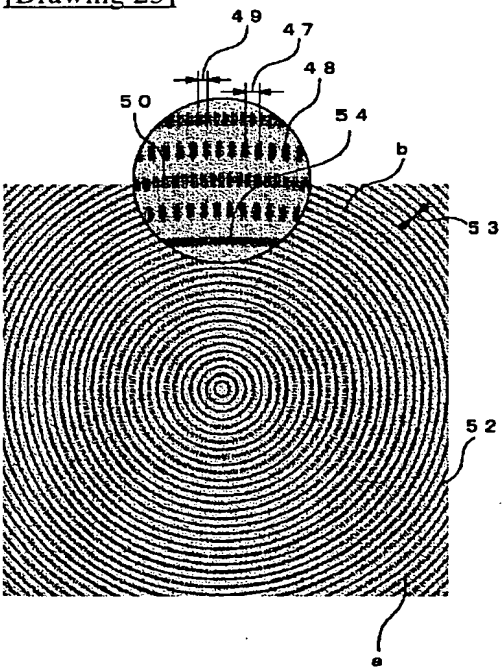
[Drawing 23]



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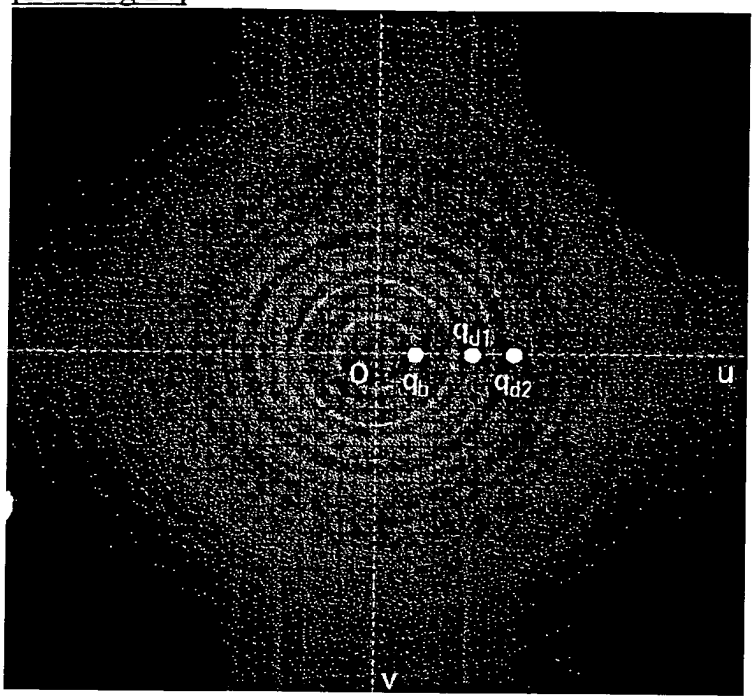
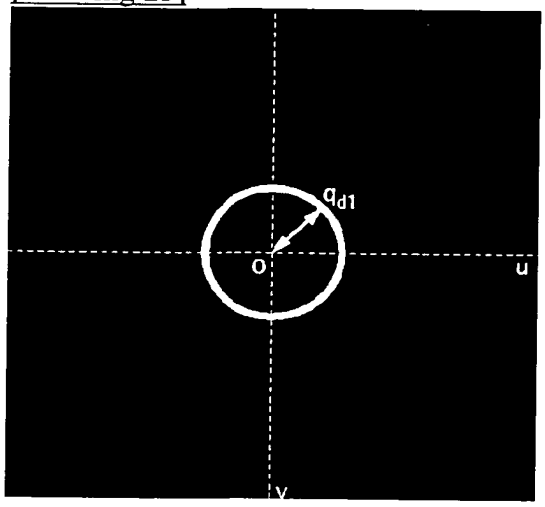


[Drawing 25]



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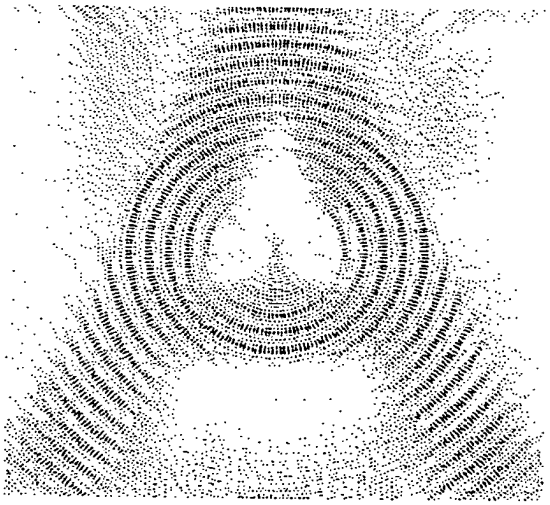
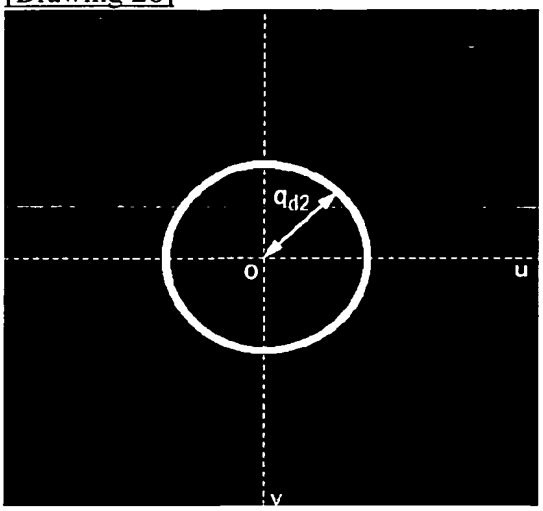
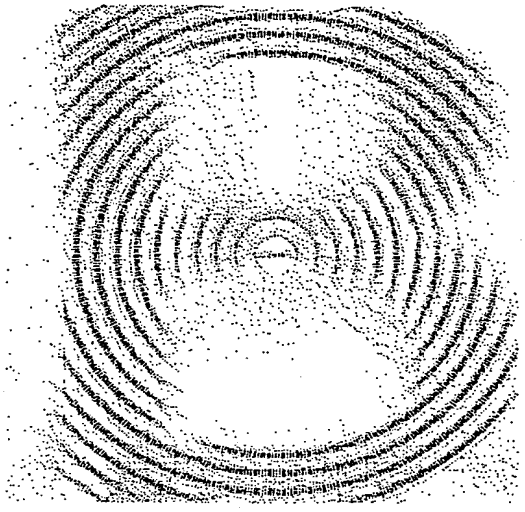


a"

[Drawing 26]



b'



b"

[Drawing 27]